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HEATING AND VENTILATING

INCLUDING AIR CONDITIONING — PIPING — REFRIGERATION — AIR SANITATION

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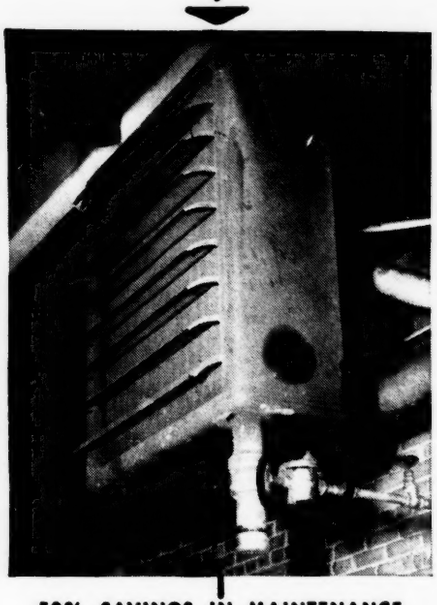

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THIS MONTH'S COVER

Fumes from electroplating baths are collected by hoods in a new, modern electroplating laboratory at the Westinghouse Electric Corp. in East Pittsburgh, Pa.

P.A.'S PRAISE

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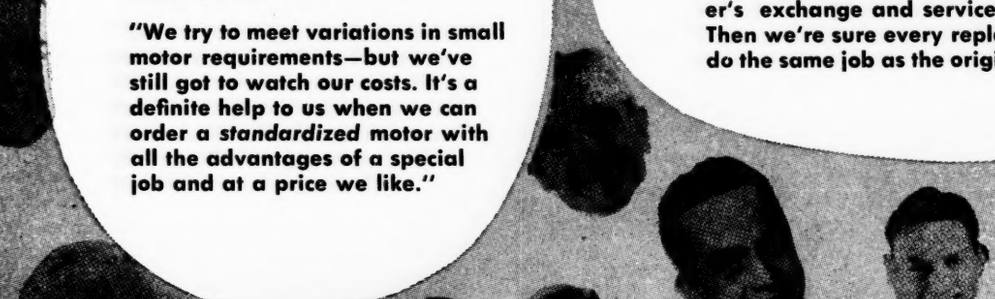

GENERAL ELECTRIC

700-101

Washington News

LORING F. OVERMAN

QUITE a few things of direct interest to the heating, ventilating and air conditioning industries were under discussion in Washington as March merged into April. Among them:

Both the House and the Senate killed the two billion dollar cooperative housing section of the Administration's "middle income" housing bill.

While Congress was debating the foregoing housing bill, the Federal Housing Administration ran out of funds to finance three of its important programs.

Private industry, via one of the large insurance companies, offered to take up the slack to the tune of $100 million pending final action by Congress.

The House Armed Services Committee approved and sent to the floor of the House a bill authorizing more than $688 million in military construction.

The Housing and Home Finance Agency announced plans for half a dozen building research projects, some involving heating, ventilating and air conditioning.

The Bureau of Labor Statistics labeled this winter's building record "the most spectacular in history."

Middle Income Housing

Because it had contemplated some two billion dollars worth of cooperatively built apartment housing which would have involved heating equipment of major proportions, the fate of this portion of the middle income housing bill is probably of greatest concern to this column. This provision of the bill had been opposed by real estate interests as inflationary—even "socialistic"—and its defeat in the House came in spite of a personal appeal for passage by President Truman.

The Senate had previously turned thumbs down on a similar provision, so this particular phase of the bill is dead for this session of Congress. The measure as passed by the House now goes to a conference committee, where differences between House and Senate versions will be ironed out. Floor consideration by both Houses will follow, and when approved, the bill will be ready for the President's signature. Since one of his pet projects will be omitted—cooperative housing—it is anticipated he will sign with reluctance, and possibly not without caustic comment.

Both the House and Senate versions now provide principally for restoring and increasing the mortgage-insuring authority of the Federal Housing Administration. The House-passed version would:

Make permanent Title I of the National Housing Act, under which the FHA can insure private loans, usually limited to $3,000, for home repairs and modernizing. The Senate version would extend Title I to July 1, 1952. Present Title I insuring authority expired March 1.

Increase to $9.5 billion the insuring authority of FHA under Title II of the Housing Act. The present $6.75 billion limitation was reached this month. The Senate bill would boost the limit to $8.5 billion. Title II, the so-called permanent provision for insuring mortgages on homes and rental projects, would under both bills become the only program for this type of insurance.

Continue present authority for the Veterans' Administration to guarantee second mortgages up to 20% of the cost of FHA-insured homes. This provision permits veterans to buy FHA-approved homes with no down payment. The bill would also extend the maximum maturity for VA-guaranteed home loans from 25 to 30 years.

Provide $750 million more for the Federal National Mortgage Association, which has used up its $2.5 billion fund to provide a secondary market for home mortgages. The Senate bill did not increase the FNMA's authority, which uses federal funds to purchase home mortgages, chiefly 4% loans guaranteed by the Veterans Administration.

Provide $600 million in FHA insurance to take care of applications for apartment rental projects filed prior to the March 1 expiration of wartime Section 608 of the Federal Housing Act. The Senate version provided $400 million to take care of applications filed before February 1.

FHA Marks Time

As the month ended, it was not expected that Congress or the President would tarry long in adjusting differences and getting the housing bill on the books. For the Federal Housing Administration, for the first time in its 16-year history, had found itself practically without authority to finance housing. Titles I and VI of the act—covering modernization and wartime housing, respectively—expired March 1. By mid-March the top limit of $6.75 billion in loan insurance was reached under Title II. About the same time, the agency's Fannie May activity—to provide a secondary mortgage market under the Federal National Mortgage Association—also ran out of funds.

Interestingly enough, the same real estate interests which have fought cooperative housing so bitterly and successfully, are equally active in pressing for quick passage of final FHA legislation. Reason is that most of the nation's builders lean heavily upon FHA backing to raise funds for home construction projects.

Last year, nearly half of the one million new housing units started were under FHA financing commitments. During the years 1947, 1948 and 1949, the—FHA insured approximately $9 billion worth of home loans—nearly half of the total of $18,400 million it has written since 1934. Although FHA does not put up actual cash to finance residential construction—unless an insured mortgage is defaulted—its insurance policies encourage private lending institutions to work with builders and buyers of homes.

Money Plentiful

Anticipating early Congressional action, private lending institutions reported having more money available for residential construction than at this time last

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year, due to a slackening of demand by industry for expansion loans. One large insurance company authorized its offices to acquire $100 million in mortgages from the Government's Fannie May during that organization's period of temporary impecuniosity. Such an acquisition would have the effect of releasing an equal amount of Fannie May funds for new commitments.

Building "Spectacular"

The housing boom which has exhausted FHA financing authorization was labeled "the most spectacular in history," in a March report of the Commissioner of the Bureau of Labor Statistics. BLS Chief Ewan Clague reported that 80,000 dwelling units were started in both January and February of this year, as compared with 50,000 in the same months of 1949.

Mr. Clague estimated that there is currently a deficit of about 1,500,000 housing units, and that construction at the rate of a million or so units a year must continue for several years to close the gap. He cited statistics showing that new households have been created during the last 20 years at a rate considerably in excess of new construction.

As reasons for the winter spurt in residential construction, Mr. Clague mentioned three possibilities. Builders and buyers are more certain that prices will not change greatly during 1950; applications for Government-insured mortgages were stepped up because of uncertainty over whether Congress would extend certain emergency mortgage provisions of the National Housing Act; and housing demand "continues virtually unabated, buoyed by high consumer income and the continuing high marriage and birth rate."

Mr. Clague also observed that the current trend toward smaller houses is not in line with latest birth rate developments. Although the marriage rate has fallen off from the post-war high of 2,300,000 in 1946 to 1,600,000 in 1949, the birth rate has remained fairly constant, he said. The high of 3,900,000 was reached in 1947. Births fell to 3,720,000 in 1948, but maintain a similar level last year despite fewer marriages.

Military Works Proposed

Of long-range interest to the heating, ventilating and air conditioning industries is the action of the House Armed Services Committee in approving and sending to the floor for consideration a giant military construction bill. Authorizing $688 million for construction by the Air Force, Army, and Navy, both here and abroad over a period of several years, the program would include a vast amount of residential and facilities construction.

In the bill ready for House action, the Air Force was granted the largest authorization—$257,975,055, an increase of $49,735,451 over grants in a Senate bill.

Navy projects totaled $243,542,301, an increase of $75,623,500.

Army authorizations totaled $187,540,825—up from $89,909,880. In addition, the committee authorized $12,439,300 for an Army special weapons project.

Of the overall total, $447,314,993 is authorized for construction within continental United States.

Research Authorized

Plans for the first of a series of construction research projects contemplated under authorization of the Housing Act of 1949 were announced during March by HHFA Administrator Raymond Foley. Agreements have been made with the National Bureau of Standards, the U. S. Public Health Service, and the University of Illinois for seven projects covering investigations of plumbing and sewage disposal systems, heating and ventilating, and chimneys and flues.

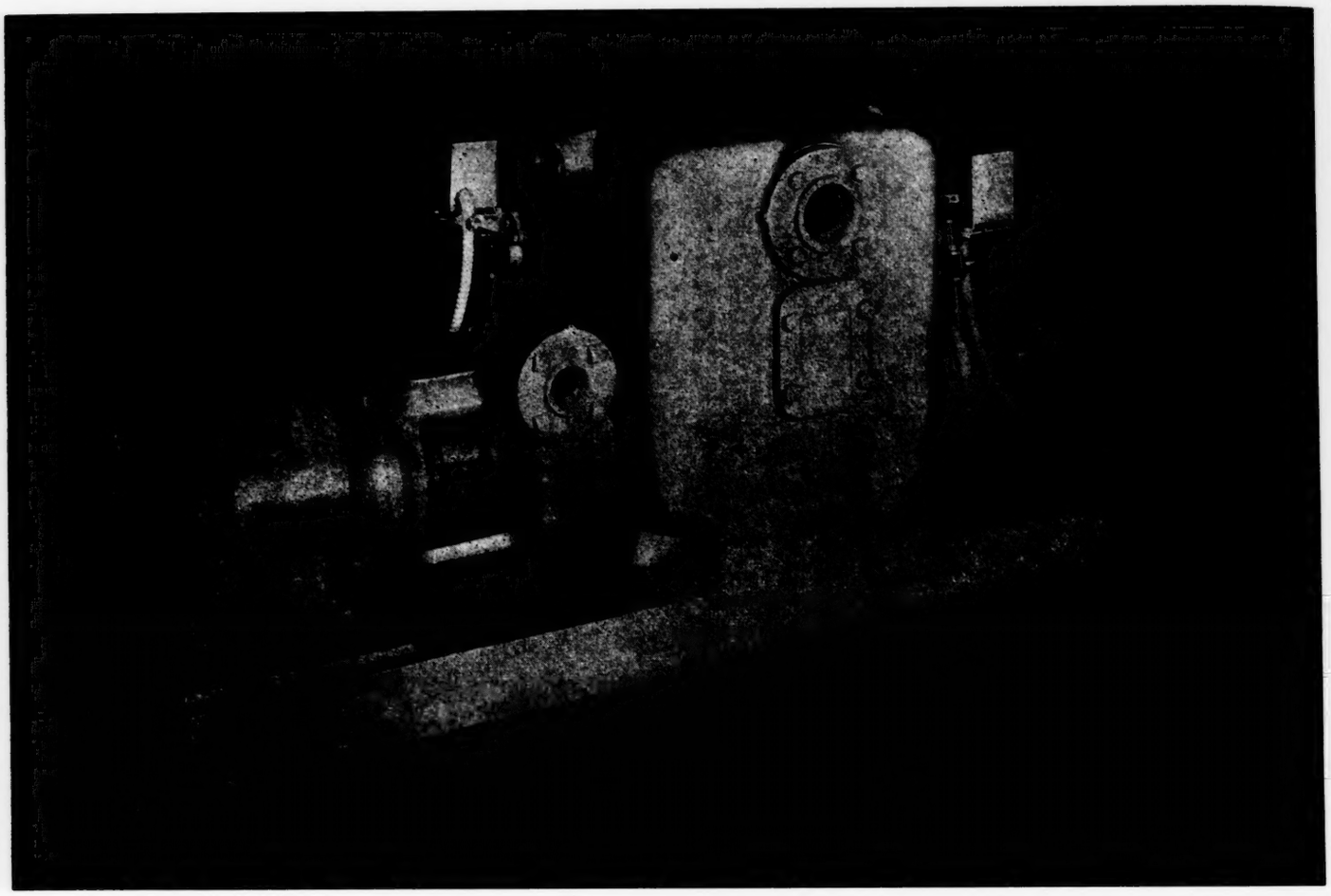
Agreements with the National Bureau of Standards cover the following investigations: (1) to provide a basis of reconciling differences of opinion on requirements for conventional plumbing installations, such as pipe sizes, stack requirements, traps, water seals, etc.; (2) to obtain accurate data on heat transfer through commonly used materials and assemblies in actual use conditions; (3) to develop data for the design of efficient smaller types of hand-fired coal heating systems; (4) to develop a basis for design of improved chimneys and flues of minimum size with adequate safety and less fuel consumption; (5) to obtain accurate data on the movement of air in dwellings in combination with heat losses and proper ventilation.

Commitments totaling $138,000 were made by the HHFA to the National Bureau of Standards for the five investigations under its direction. The commitments are made under Title IV of the Housing Act of 1949, which authorizes for the first time a comprehensive and coordinated housing research program. It directs the HHFA Administrator "to carry out a program of research and studies concerned with housing economics and other housing market data, and with development, demonstration, and promotion of acceptance and application of new and improved building materials, methods and techniques, directed toward increased and sustained production of more adequate housing at lower construction costs." It provides that the HHFA Administrator shall make use, as far as feasible, of existing facilities of the Federal Government adapted to technical research. The Administrator is also authorized to carry out this program in cooperation with industry and labor, state and local governments, educational institutions and other non-profit organizations.

In directing the National Bureau of Standards to study chimneys and flues, the HHFA observes that both constitute an important safety factor for houses and the neighborhood, as well as a significant cost item in housing construction. More exact information, the HHFA contends, is needed with respect to materials and design in actual housing use as to safety, performance and cost. The investigation to be carried out by the Bureau of Standards will study the entire range of conditions to which chimneys are subjected in actual use and will test the effect of these conditions on materials and performance in order to develop a rational design basis for masonry chimneys in accordance with conditions of housing use.

Studies of heating and ventilating are dictated, HHFA observes, by the rapid development of new types of heating systems, and new structural and insulating materials.

MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.



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HEATING, VENTILATING AND AIR CONDITIONING AN Electric Generating Station

LLOYD L. GAREY
Senior Engineer, Electric Engineering Department
Public Service Electric and Gas Co., Newark, N. J.

Maintenance of closely controlled atmospheric conditions in steam power plants is a relatively new concept made feasible by semi-outdoor construction of boilers. An up-to-date system at Public Service's Sewaren plant is described.

IN recent years considerable attention has been given to the ventilation of steam power plants. Two methods of ventilation are in general use, namely, vertical flow and horizontal flow of the ventilating air. Vertical flow, the older of the two methods, consists largely of having ample window openings at the lower levels and exhausing the warm air through the roof or from the upper portion of the boiler house. With the modern high type of boiler, this method sometimes leaves hot spots in the station, makes quite strong up-drafts in certain areas, and tends to have excessive temperatures at the top of the boiler house. The horizontal flow method, whereby air is admitted or supplied at various levels in the station and exhausted at various levels, usually results in more uniform temperature conditions throughout the station and materially reduces the temperature at the top of the boiler house.

The construction of the new Sewaren Generating Station of Public Service Electric and Gas Company presented an opportunity to give some serious attention to the problems of ventilation and cleanliness. The first section of the station has three 110,000 kilowatt turbine-generator units, each supplied by a single boiler with throttle steam at 1,500 psi and 1,050F. These units are now in service and a fourth is on order for operation in 1951. The plant was designed to burn either coal or oil but has recently been changed so it can also burn natural gas when available.

Considerable care was taken in the design and selection of equipment to keep dust from the coal and ash handling equipment to a minimum. Since approximately the back half of the boilers, together with the forced and induced draft fans, air preheater, precipitator and stack are outside the building, the heat gain from the equipment is greatly reduced. This arrangement permitted a boiler house design in which there are no operating-type windows to let in dust and the installation of a ventilating system of moderate size to remove the excess heat. There is no wall between the boilers and the turbine room which also has fixed or glass block windows and is served by the same ventilating systems.

In Fig. 1, above, notice that the stacks, fans, etc., are on the ground in back of the boiler house with the semi-outdoor boilers. The large middle section of the building is the turbine room and the low section next to the water, the service building. This three-story building houses the offices, cafeteria, test department, machine shop storeroom, locker rooms, etc. The various ventilating systems serving these buildings, namely, three main systems, one for each boiler-turbine unit now installed, two for the service building and two air conditioning systems, one for each control room, will be discussed in some detail.

Main Ventilating Units

The design of these systems is based on two conditions, namely, that little dirt will be made by the operation of the equipment in the building and that the few windows that may be opened will be kept closed except in emergency. The plan is to supply clean filtered air

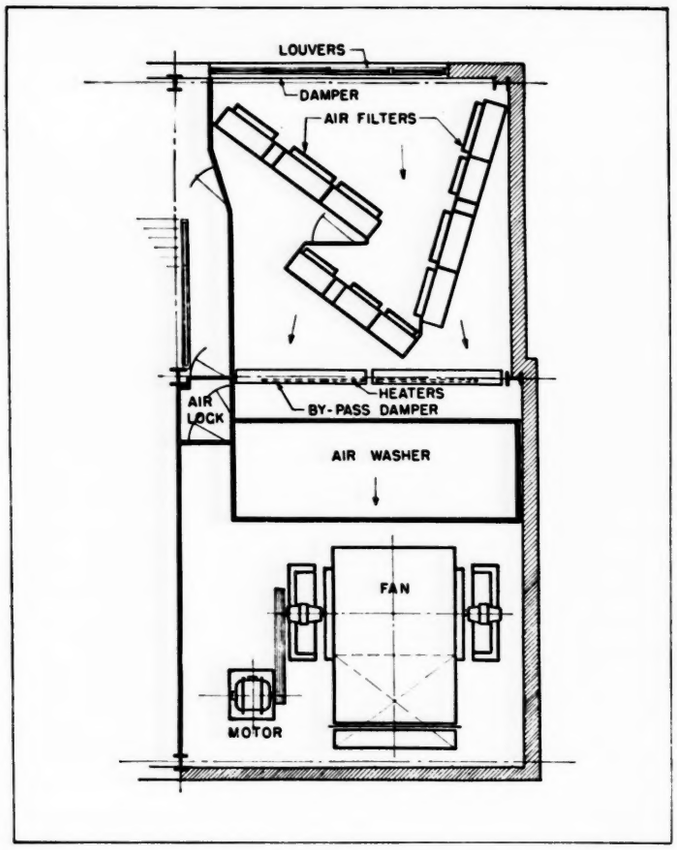

Fig. 2. Fan room layout.

to the buildings in slightly greater quantity than is being exhausted, in order to keep wind-borne dust outside. Furthermore, the ventilating air is distributed to the hot areas at the various levels approximately in proportion to the heat losses. It is exhausted from the building at various levels. Air quantities were based on a 15F rise above supply air temperature.

Each of the three main ventilating systems supplies 120,000 cfm of outdoor air and takes care of the area occupied by its respective boiler and turbine. Each system has an air filter, heating coil, by-pass damper, supply fan, a number of exhaust fans, ductwork and control system all working as a coordinated system. A layout of a typical fan room is shown in Fig. 2.

The filters for the main systems are American Air Filter Co. multi-duty automatic self-cleaning units with rotating screens which deposit dirt in a viscous oil bath during each revolution. These panels are driven by a small motor with automatic timing mechanism which can have its operating time varied to suit the dust content of the air.

Each of the three main fans is a No. 12 LLD Buffalo Forge Co. double inlet limit-load type with inlet vane control. They are "V" belt driven by 75 hp motors.

The only heat supplied in the boiler and turbine rooms, except losses from the boilers, turbines, and auxiliary equipment, comes from finned type coils in the ventilating systems. In normal winter operation, the boiler room will require little or no additional heat except when a boiler is shut down, but the turbine room will require additional heat during much of the winter season. Hence, each branch duct supplying air to the turbine room contains a booster coil under thermostatic control for supplementary heating. Steam for the coils is supplied from the 30-50 psi steam heating header.

Evaporative Cooling

Because of the high internal heat pick-up in the building and the fact that the wet bulb temperatures in this geographic area seldom exceeds 78F, it was decided to try an air washer to give evaporative cooling on the No. 1 ventilating system. The washer unit consists of 350 spray nozzles in a single counter-flow bank, a 775 gpm pump driven by a 20 hp motor, and stainless steel eliminator plates. The washer recirculates the water and uses only a small amount of make-up to provide for evaporation and overflow to maintain clean water. Whenever the outdoor dry bulb temperature exceeds 65F, the washer pump starts automatically, but will stop if the indoor humidity exceeds 65%. Either setting can be varied as desired. The reduction in dry bulb temperatures from evaporative cooling was regularly to within one or two degrees of entering wet bulb. Evaporative cooling was used throughout the past summer and reduced the dry bulb temperature of the ventilating air from 4 to 20F below intake air temperature and made the area served by the No. 1 ventilating system decidedly more comfortable than the adjacent areas not equipped with evaporative cooling. In fact, it was so satisfactory that washers are now being installed for the No. 2 and 3 ventilating systems in spaces which were provided in the original layout.

Distribution System

The three main fan rooms are located in the boiler room, each serving the area occupied by its respective boiler and turbine unit by means of a duct system. A typical schematic diagram of one of these systems is shown in Fig. 3. The ducts are completely supplied with dampers and splitters to permit adjustment of air quantities and all outlets have two-way blades to control the direction of air flow.

With the large amount of air being supplied to the station, definite provision must be made for its release. Two Davidson roof exhaust fans of 45,000 cfm total capacity are located over each unit in the turbine room. In addition, the north wall of the boiler house contains 12 American Blower tube-axial exhaust fans having a capacity of 15,000 cfm each and are located at various levels. Fig. 4 shows the general locations of these fans.

Another feature of these systems is the exhaust recirculating duct which collects air from a middle and a top location in the boiler house and exhausts 50,000 cfm from each unit in the summer and returns it to the fan for recirculation in winter if warm air is needed. Any recirculated air is filtered.

Control Systems

The operation from maximum cooling to heating is fully automatic by means of a Johnson Service Co. pneumatic control system. A panel board similar to Fig. 5 is located adjacent to each main ventilating unit. The large instrument in the center of the panel is the Taylor Fulscope controller, which also records the air temperature leaving the fan and the temperature at the main operating floor. Indicating thermometers

give the outdoor air temperature and the temperature of the air entering the fan. Gauges show air pressure at each of the three pneumatic-electric switches used for cutting in or out the various exhaust fans.

In summer, when only cooling is required, each main unit supplies 120,000 cfm of outside air with all exhaust fans and exhaust ducts in operation. The thermostat controlling each ventilating system is located in the boiler room on the main operating floor in its respective area. This thermostat together with the humidistat for the air washer are mounted in an aspirating cabinet with a small fan and filter for getting a better sample of room air. As it becomes cooler outside and the boiler room temperature goes below the thermostat setting, it will cause the Taylor Fulscope controller on the ventilating panel board to make certain changes in the following steps:

(a) The main ventilating fan continues to deliver 120,000 cfm, but warm circulated air is increased slowly from 0 to 50,000 cfm and outside air is reduced accordingly.

(b) As still less cooling is called for, the inlet vanes on the fan gradually reduce the fan delivery from 120,000 to 50,000 cfm, the recirculated air staying at 50,000 and the outside air reducing to zero. While the main fan is reducing the amount of outside air being supplied, the exhaust fans in the turbine room roof and in boiler house walls are cut out in three steps.

(c) When the fan is down to 50,000 cfm of recirculated air with no outside air and more heat is required, the steam coil will cut in. This coil can increase the air temperature 30F.

(d) As less heating or more cooling is required in the boiler room, the above cycle will automatically be followed in reverse order.

(e) The thermostat in the turbine room and steam coils in the turbine room branch ducts operate independently of the main system and endeavor to maintain proper temperature in the turbine room. These coils can raise the air temperature 28F when operating with full fan delivery and higher when the air quantity is reduced.

The purpose of these steps, of course, is to automatically maintain satisfactory temperature conditions in the building, and at the same time keep the air exhausted from the building equal to or slightly less than the quantity supplied. If experience indicates that certain steps should come earlier or later in the operating cycle, this can be arranged by changing the tension on the control springs or by changing the springs of the air actuated control instruments.

In case of trouble any of the three main ventilating systems can be shut down from the station control rooms. When a main system shuts down, all its exhaust fans also stop, unless a particular exhaust fan has been put on manual operation for a special reason.

Service Building Ventilating Systems

The service building has two ventilating systems, one operating only in the daytime and the other on a 24-hour basis. The systems operate on 100% outdoor air at all times and for summer operation the design ranges from a three-minute air change in the offices to a seven-minute change in the storerooms. In this building, only a few of the windows are of the operating type and they are intended only for emergency use if the ventilating systems are shut down. There are also two roof exhaust fans which operate on on a daytime and full-time basis, respectively. By means of duct systems, these fans exhaust air from lavatories, shower rooms, load centers, motor-generator room and battery room. Since this exhaust air is only a small part of the air supplied to the service building, the remainder is allowed to escape to the turbine room to do further cooling or heating. The operation of this ventilating equipment in the service building gave very satisfactory results throughout the past summer.

The major equipment for these two supply systems is located in a common fan room on the top floor of the service building. Each system has a double inlet fan with vane control, automatic self cleaning filters as described under the main systems, and two banks of heating coils and by-pass dampers.

The daytime fan serves the offices, test department, cafeteria, machine shop and other areas normally having only daytime use. Its capacity is reduced from 64,000 cfm in summer to a minimum of 35,000 cfm in winter by inlet vanes, controlled by a thermostat in the general office. After the air has been reduced to the minimum and less cooling is called for by the room thermostat, steam will be admitted to the heating coils under control of the room thermostat. When outdoor

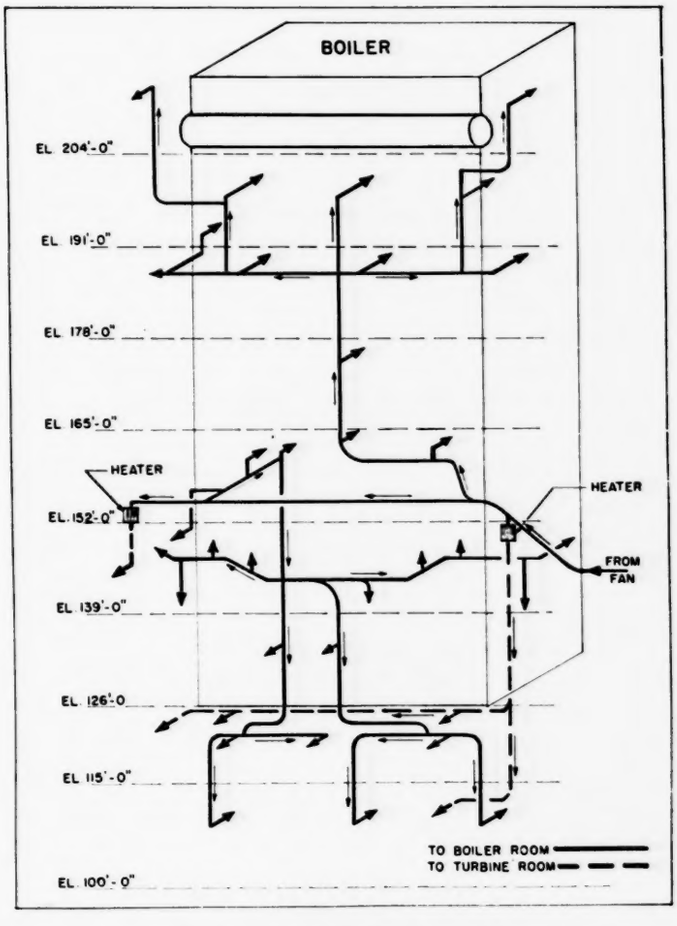

Fig. 3. Air distribution diagram.

temperature drops below 60F (or other predetermined temperature) control of the heating coils will be transferred from the room thermostat to a thermostat in the fan discharge which will be set at 72F for tempering the air throughout the heating system.

The 24-hour fan, with a capacity of 20,000 cfm, supplies areas such as electric-load centers, substations, battery room and locker rooms. This fan reduces to a minimum of 10,000 cfm in winter and has the same method of controlling air temperature as just described for the daytime fan.

Several special purpose exhaust systems were installed, such as for welding fumes, laundry, chemical hood, blueprint machine and cafeteria hood, which would be used only when such equipment is in service.

Control Room Air Conditioning

Complete control of the four-unit station is centered in two control rooms, one for each two turbine-generators. Each control room is located at the center of the area occupied by the two units under its supervision, and is provided with sound-proofing and year-round air conditioning.

A 7½-ton Westinghouse compressor and air conditioning unit serves each control room. These units are provided with both heating and cooling coils under automatic control as room conditions may require. The amount of outside air varies automatically from a minimum of 20% (for extremely warm or cold weather) to 100% in moderately cool weather when outside air may be used directly to cool the control room. As a precaution, the outside air intake is located above the boiler house roof to reduce the possibility of drawing smoke into the control room in case of a fire within the building.

Heating Systems

Each of the first three units has an evaporator which uses bleed steam from the turbine. These evaporators may be used to supply either make-up water for the boilers or steam to the 30-50 pound header for heating fuel oil, chemical mixing tanks and the buildings. If necessary, steam can be bled directly from any of the turbines to the heating header. For heating the building during construction, a 500 hp Cleaver-Brooks oil burning steam generator was installed. This boiler can in emergency serve as a spare evaporator, reinforce the heating system, or supply 150-pound steam to the dock for unloading oil barges.

In the boiler and turbine rooms, already described, heat is supplied only through the ventilating system. These systems take steam from the heating header and are under automatic control.

Heat for the service building to take care of maximum winter losses is provided by unit heaters in the machine shop and store rooms and by wall-hung Vulcan (finned pipe) radiators with grille covers in the offices and locker rooms. The service building ventilating systems have heating coils and in winter automatically switch over to a smaller quantity of air supplied at room temperature.

The three major coal handling buildings, namely, the barge unloading tower, the breaker house, and the reclaiming tower are separated from the main building. An underground steam main supplies steam at 30-50 pounds to unit heaters in the breaker house and the unloading tower. This heating equipment is designed to maintain 60F on the first floor where yard equipment is stored and maintained and 40F on the upper floors. The electric substations in these buildings are supplied with electric unit heaters.

The operator's cab in the coal unloading tower is heated by 15 kw of electric resistance heaters, located on all four sides of the cab. The heating elements may be cut in manually in three steps, all of which are under thermostatic control.

Ventilation of Conveyor Room and Coal Bunkers

The conveyor room, where the coal is brought from the breaker house via belt and dumped into the various bunkers, has large sections of glass block along one side but no windows that open. Air from the main ventilating system is delivered to the conveyor room and is permitted to escape through roof ventilators.

The slots in the conveyor room floor where the coal falls into the bunkers are sealed with belts and the tripper is sealed as well as possible to keep dust from escaping from the bunker. To further prevent this escape of dust, the bunkers are kept under suction by an exhaust duct at each unit which connects into the induced draft system just ahead of the precipitator.

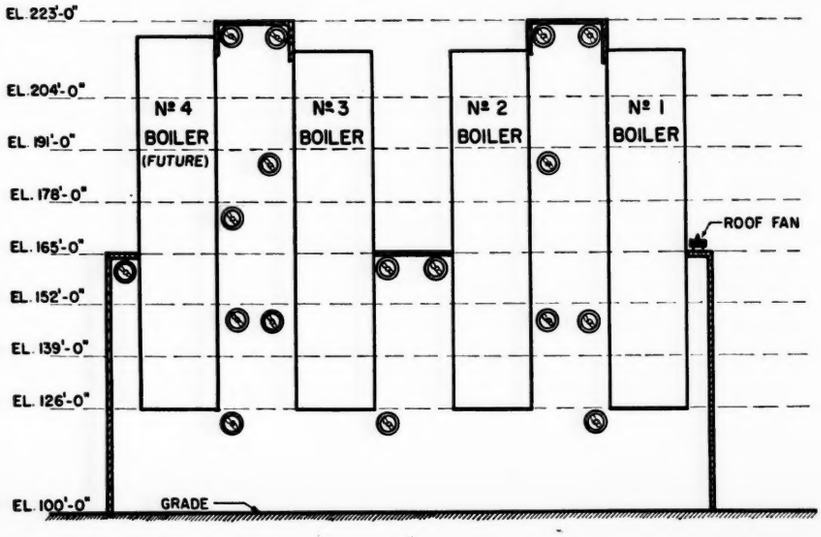

Fig. 4. Exhaust fan locations.

A small vent connection from each of the coal weighing scales also connects into the same exhaust duct.

A further effort to eliminate dust from the conveyor room was the installation of a Rotoclone exhaust and dust collector. This equipment provides a good suction at the transfer point where the coal is dumped from the incoming belt to the belt supplying the tripper which dumps it into the various bunkers. This equipment plus the bunker exhaust system have resulted in an unusually clean conveyor room.

Breaker House Exhaust System

The breaker house might be called the coal switching center of the system. Here coal passes through the Bradford breaker on its way from the barge unloading tower to the station bunkers or the storage yard. When coal is reclaimed from the yard storage piles, it again passes through the breaker house on its way to the bunker, all of which requires five conveyor belts and six points of transfer. In spite of using equipment of best modern design, a considerable dust problem was encountered during initial operation.

To eliminate this, we are installing a No. 16, type N, Rotoclone dust collector driven by a 50 hp motor. This unit will exhaust a total of 18,000 cfm and maintain a suction at the Bradford breaker and at each of the six transfer points. Clean air from the Rotoclone is discharged through the roof. The coal dust is collected in the form of a heavy sludge at the bottom of the tank of the Rotoclone unit and is continuously removed by a scraper system which deposits it at the inlet of the Bradford breaker.

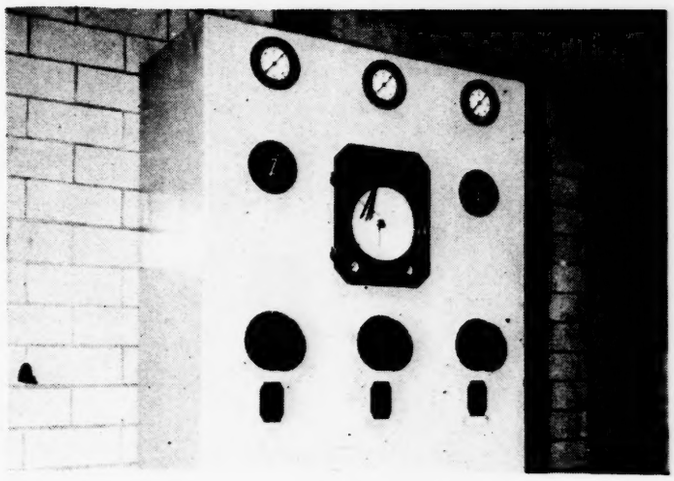

Fig. 5. Ventilation control panel.

Conclusion

This article has endeavored to outline the various steps taken by the Public Service Electric and Gas Co. in the Sewaren generating station to maintain a clean plant with a minimum of maintenance and housekeeping and to provide the most comfortable and healthful working conditions possible for the employees. Operating experiences to date, indicate reasonable success in attaining these objectives.

Big Tannery Installs Air Conditioned Storage for Hides

W. D. Byron & Sons have operated a tannery at Williamsport, Md., since 1897. The storage room in which hides are kept is now air conditioned, using a special system furnished by Frick Co. on specification by Harold G. Burrill and Associates of Baltimore.

The hide storage space measures about 96 ft by 46 ft and has a low ceiling 8½ ft high. The building is an old one with 24-inch stone walls, covered on the inside with a thick layer of plaster. The loft above the ceiling contains the air ducts, which are insulated with corkboard. The storage space is held between 31F and 33F, with a relative humidity of 80%, while being loaded, and 85% to 90% for holding purposes.

At one end of the building is a large handling room connected with the loading platform. Here the hides are sorted, weighed and piled on pallets.

At the opposite end of the building is a brick addition which houses the refrigerating equipment. On the roof of this is a Marley cooling tower. About one-third of the refrigerating machinery space is devoted to a high room in which the fan and cooling coils are placed. The coils are slightly over 14 ft long, and consist of prime-surface pipe, over which brine is sprayed to remove frost. The brine spray nozzles are turned upward; the brine strikes an inverted trough which directs it downward over the coils without splashing. A large brine tank, 19 ft long by 8 ft wide by 1½ ft deep, is placed below the coils. Circulation is maintained by a bronze-fitted pump of 175 gallons capacity.

An American Blower fan above the coils is driven at either of two speeds by a 20-hp motor. The fan pushes the air downward through the coils and eliminators, into the ducts above the ceiling of the storage. Eight louvered openings distribute the air over the hides. Approximately 54,100 feet of air are circulated per minute. Galvanized steel sheets direct the air through the coils and eliminators.

Refrigeration is provided by two enclosed ammonia compressors of size 6 by 6 and 7 by 7. Both machines are equipped with Flexo-Seals, automatic unloading devices, and force-feed lubrication. They are driven through V-belts by motors of 30 and 50 hp, respectively. Other high-side equipment includes two 24-inch by 14-ft vertical shell-and-tube condensers, a 20-inch by 5-ft oil trap, a 20-inch by 16-ft receiver and a purger.

The completed storage takes care of about 600 tons of hides, keeps them in first-class condition, and effectively prevents loss by shrinkage.

Designing the Flash Tank

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A flash tank permits condensate at high pressure to flash into steam for use in a low pressure steam heating system or in heating a hot water supply. Steps in the design of such tanks and the determination of proper tank sizes are covered in this article.

THERE seems to be no published information as to how to design a flash tank. One puzzles awhile over the problem, then arbitrarily selects a size which has no relation to proper velocity of flash steam leaving the disengagement area, nor to steam and water volume within the tank. Due to the need for such data the writer has worked the problem out backwards from the sizes of flash tanks as made by one manufacturer in connection with the continuous blow down process. Such data are given in Table 1 for 12 different tank sizes and are also presented in the curves of Fig. 1, thus permitting selection on the curves at intermediate points between tank sizes.

As shown in Fig. 1, the velocity of flash steam leaving the disengagement area is low at 200 fpm in small tanks, but increases up to 400 fpm in very large size tanks. The disengagement area will vary, of course, along the same lines. Sizes of tank that are convenient to manufacture and stock affect the available tank volume. This varies from 2 to 4% of the volume of steam flashed per minute. The diameter of flash or vent pipe outlet from the tanks, Table 1, is based on a steam velocity of about 11,000 fpm. Water storage space is one-third of the tank volume.

TABLE 1. FLASH TANK DIMENSIONS FOR VARIOUS STEAM CAPACITIES
Tanks Provided with Tangential Inlet*

Tank No.	Diameter, of Tank, Ft.	Height Over Heads, Ft.	Area, Sq Ft	Volume, Cu Ft	Diameter of Vent, Inches	Flashed Steam	
						Cfm	Lb.†
1	2.0	4.25	3.1	13	3	627	26
2	2.66	5.5	5.6	28	4	1,058	45
3	3.33	6.66	8.7	58	5	1,645	70
4	4.0	7.83	12.5	98	6	2,390	101
5	4.5	8.16	15.9	116	8	4,113	174
6	5.0	8.5	19.6	160	10	6,658	281
7	5.5	8.75	23.8	200	12	9,400	397
8	6.0	9.0	28.3	222	14	11,360	480
9	7.0	10.5	38.5	400	16	15,667	662
10	8.0	12.0	50.2	600	18	19,192	811
11	9.0	13.5	63.6	830	20	23,892	1,010
12	10.0	15.0	78.5	1,010	24	34,858	1,474

*For tanks with top inlet, multiply quantity of steam flashed, as given in table, by 0.70.
†Quantities are for 2 lb gage pressure. For flash pressure of 0, 1, 5, 10, 20, 30 and 40 lb per sq in., multiply tabular quantities, respectively, by 0.89, 0.95, 1.17, 1.44, 2.00, 2.50 and 3.06. In the same order, the specific volume of steam at the stated pressures is 26.8, 25.2, 20.4, 16.5, 12.0, 9.5 and 7.8. The height of bumped head for the first 6 tanks is 3 9/16, 4⅜, 4⅝, 6⅜, 7¼ and 7⅝ inches. This is for code tanks, but non-code tanks have practically the same height.

TABLE 2. PER CENT OF CONDENSATE FLASHING AT VARIOUS GAGE PRESSURES

Flash Pressure, Lb per Sq In.	Condensate Pressures, Lb per Sq In.			
	10	20	30	40
1	2.5	4.6	6.1	7.5
2	2.2	4.2	5.8	7.2
5	1.3	3.3	5.0	6.3

Values tabulated are for tanks with a tangential inlet wherein a channel iron spiral within the tank directs condensate with very little splashing or disturbance of the water space and also provides additional disengagement area. The tangential inlet is desirable more where the tank receives intermittent blow-off water than where it receives a continuous flow of condensate from a heating system. For top inlet tanks, the quantity of steam flashed will only be 70% of the tabular values.

The proper multiplier as given in the footnote of Table 1 should also be used when the steam is flashed at other than 2 lb gage pressure. For example, steam flashed at 2 lb gage pressure has a specific volume 2½ times that of steam flashed at 30 lb pressure. Therefore, any given tank will flash 2½ times as much pounds of steam at 30 lb as it will at 2 lb pressure.

Assume a condensate return system with steam at 30 lb gage pressure having a corresponding heat of liquid of 243 Btu and returning 2,738 lb of condensate per minute to a tank to flash down to the pressure of a heating system at 5 lb pressure. Flash steam and air will vent to the steam mains of the 5 lb system while condensate from the tank will combine with the returns from the same system, then the mixture will go to a vacuum pump. The condensate at 30 lb will flash to the lower pressure of 5 lb which has a heat of the liquid

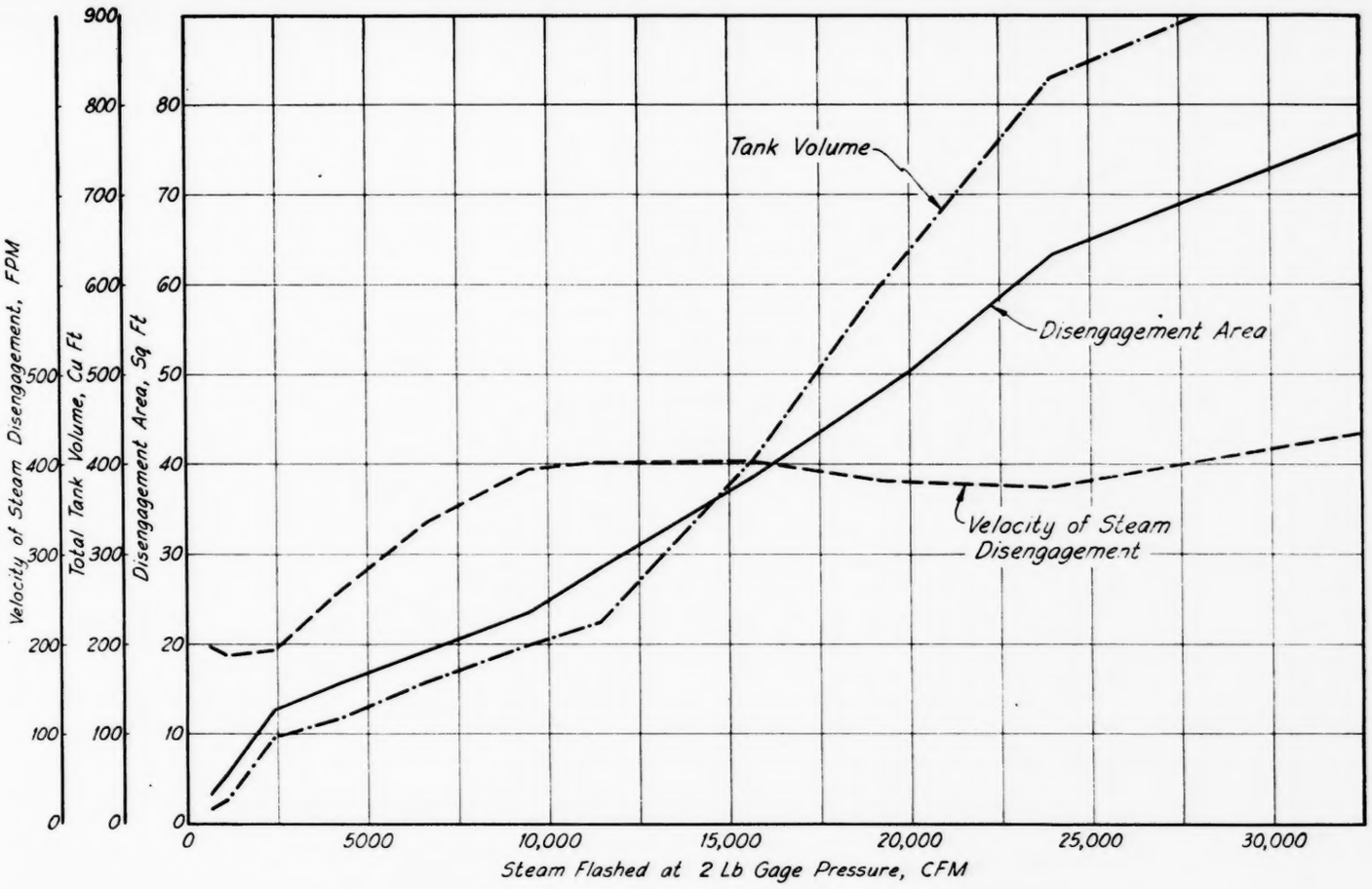

Fig. 1. Design data for flash tanks operating at 2 lb gage pressure.

of 195 Btu and a latent heat of 961 Btu. Then, 243 — 195 = 48 Btu, the excess heat at 5 lb which will flash. Therefore, 48/961 = 5% of the condensate flashed into steam, as given in Table 2.

The specific volume of steam at 5 lb pressure (see Table 1) is 20.4. Hence, 2,738 lb × 20.4 × 5% = 2,793 cfm of steam flashed at 5 lb. Since Table 1 and the curves are for 2 lb pressure, allowance must be made for the difference in specific volumes. This can be calculated, or obtained directly from Table 1 by dividing 2,793 cu ft by 1.17 (as given in the footnote) which gives 2,390 cu ft. For this quantity, Table 1 and the curves give the required disengagement area and volume of the tank while Table 1, in addition, gives convenient dimensions to obtain such area and volume. (See tank No. 4.)

If a tank with a top inlet is used we select tank No. 5, as the quantity of steam flashed for a top inlet tank will only be 70% of that in a tank with tangential inlet. Should the system be flashed directly to atmosphere, instead of going to the heating system at 5 lb pressure, then the quantity of steam which can be properly handled or flashed from this tank will be 89% (See footnote, Table 1) of the quantity designated for the tangential inlet, or only about 62% (89 × 70 = 62) if the top inlet is selected. Tank No. 5 would still be of adequate size for such a condition.

Boiler design gives some cue to proper design of flash tanks, although conditions in a boiler are somewhat different and more severe. Comparing a flash tank with a firebox boiler it will be found that the boiler has a greater steam volume and a much greater disengagement area, for velocity of the steam leaving the water must be kept down (usually 150 to 175 fpm) to avoid lifting or throwing over of water to the heating system. The lift to steam outlet is also of less height in a boiler. In the case of a water tube boiler, the disengagement area is less than in a firebox boiler, possibly because of the greater facility for return circulation of water at many more points. Evaporation in a firebox boiler is greatly affected by the steam leaving the boiler all at one point. In a cast iron sectional boiler there are usually several steam outlets.

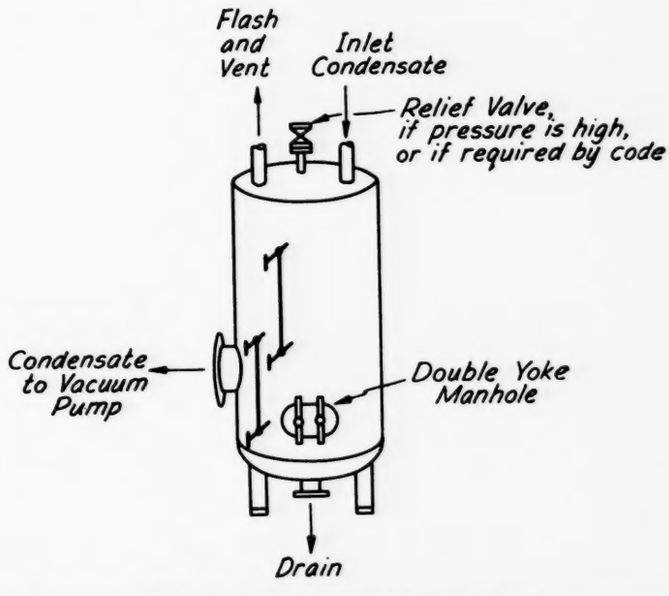
Flash and Vent
Inlet Condensate
Relief Valve, if pressure is high, or if required by code
Condensate to Vacuum Pump
Double Yoke Manhole
Drain

Fig. 2. Flash tank with top inlet.

Evaporation or flashing in a steam boiler is also affected by the cleanliness of the water and whether the steam space is sufficient to allow water particles to drop out and also to prevent sudden fluctuations in steam pressure. For example, an oversize steam outlet from a boiler permits any sudden demand for steam to quickly lower the boiler pressure. This in turn makes a fluctuating water line and quick flashing of steam to the lower pressure. The greater volume of flash steam which results will cause a high velocity of steam leaving by way of the boiler outlet, thus causing lifting or carrying over of water.

Sometimes in boilers having a comparatively small steam space, a collecting or dry pipe is installed in the steam space and connected to the steam outlet. Such a pipe is closed at the ends, provided with slots along its top and arranged for drainage. In this way steam is received from many more points and the water separated out. For similar reasons, a flash tank is sometimes provided with interior baffles and inlet and outlet arranged, both to change direction of steam flow. The tanks may even be equipped with a steam separator on the steam outlet. Of course, the tangential inlet provides good separation of steam from the moisture that is present.

When designing a flash tank, it should be remembered that steam may be in the returns, either because of leaky traps or by flash in the returns (should pressure lower therein due to lower temperature in long uninsulated returns). Any steam flashing in the return puts less burden upon the disengagement area in the flash tank and all steam entering the tank only affects the steam space of the tank and the velocity of steam leaving the tank. Incidentally, the disengagement area of a flash tank is actually greater than the area of its diameter, since steam flashes from condensate all the way down from the top inlet to the surface of the condensate at the bottom of the tank.

The Need for Competent Design

It is amazing the amount of money wasted in improper planning and layout of industrial plants, public buildings and other structures. If this is true of heating and ventilation, it is quite possibly true of other phases of structural engineering. Who is to blame for these costly errors? Is it the owner, the builder, the architect? In some instances it is one and in others it may be all three. If a competent heating and ventilation engineer is consulted before the building is planned, a greater degree of efficiency is obtained, as well as a financial saving in most cases. If the building is a manufacturing plant with ventilating problems, the insurance carrying company's engineering department should also be consulted; it will be most happy to give a list of the minimum requirements.

As to inefficient construction and layout, there are several glaring examples. In each of these instances, had the insurance carrier been consulted, a considerable cash saving would have been made. The same holds true if the designing architect had brought in heating and ventilating engineers to help in the design and construction details.

Case No. 1.—A small plant was engaged in the manufacture of phonograph records, during which there were considerable grinding operations. Up to the time a new insurance carrier arrived in the plant, little or no thought had been given to adequate ventilation. The insurance engineer recommended proper exhausting of explosive dusts and installation of magnetic collectors. Had this been done when the plant was laid out, the subsequent explosion at the grinding machine would not have happened, an explosion which severely burned the operator and nearly cost him the sight of both eyes. The plant today has a continuous cleansing and change of air, with no harmful dusts in dangerous quantities. Furthermore, where it was claimed no foreign substances were ever found in the grinding mix, there is now about a tea cupful of nails, tacks, and other sparking pieces taken out every few days.

Case No. 2.—A plant engaged in sheet metal work entailing a large amount of degreasing and spraying work had occupied a small building for many years with a very unfavorable compensation experience due to the toxic fumes throughout the plant. Their insurance carrier surveyed the building and gave their list of recommendations to bring the shop up to standard. Fortunately, the owners were financially well off and decided rather than install the costly exhaust and ventilation systems they would build a new plant. This was done and, on the insistence of the insurance carrier, a firm of competent heating and ventilating engineers were brought in to assist in setting up the new plant.

Case No. 3.—A large ceramics firm in southern New Jersey planned to triple the size of its plant. At about the same time they were being plagued by their insurance carrier to provide proper ventilation and exhaust systems in their present plant. Since the existing plant was not to be discarded, expensive changes had to be made to make conditions coincide with those in the new section. Fortunately, the insurance carrier and competent heating and ventilation engineers were consulted before the new plant was constructed. However, the cost of properly exhausting and venting the old plant nearly equalled that of the twice as large addition.

These are only three of the many cases known to the author. There are hundreds of others in the files of his company, which, multiplied by the records of all companies, probably run into the thousands—cases where hindsight has cost millions of dollars which would have been saved if heating and ventilation engineers had been consulted.—*A. F. Fuller, Supervising Engineer, The Century Indemnity Co., Newark, N. J.*

An Orifice-Variable-Area Meter for Small Air Flow Measurement

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An orifice-variable-area meter is described which permits the measurement of small air flows, such as encountered in air sampling techniques, to be made with conveniently portable equipment and with improved accuracy and dependability. Applications of this metering device to the electrostatic precipitator and two types of filter paper collecting devices are illustrated. **The project for which the meter was developed was supported by a cancer control grant from the National Cancer Institute, U. S. Public Health Service. Thomas F. Mancuso, M. D., was project director.**

THE Donora disaster, together with recent studies of the effects of airborne beryllium and chromium compounds, have accelerated an increasing awareness of the danger of atmospheric pollution to life and health both within plants and in surrounding areas (1, 2, 3, 4, 5)[1]. As a result, increased attention is given to air sampling techniques and equipment. Accurate air sampling, and full knowledge of limiting criteria of toxicology and process conditions are often the necessary prelude to adequate ventilation design. Hence, the aims of industrial hygiene and ventilation engineers are closely allied and are mutually dependent upon air sampling methods.

Air Sampling Methods

The choice of a method for collecting an air-borne toxic material for chemical analysis depends upon its physical nature. Particulate matter such as fume, dust, and mist may be collected by electrostatic precipitation, mechanical filtration and impingement devices, while vapor and gas, of molecular size, are frequently caused to react with a chemical reagent in a gas washing device.

Fig. 1 shows schematically a successful apparatus for collecting chromate dust and mist for analysis, and consists of a suitable filter paper contained in the holder *A*, an air flow meter *B*, and a motor driven vacuum pump *C*. The vacuum pump causes air to flow through the filter paper and metering device. Dust or mist is quantitatively removed by the filter paper and when a sufficient volume of air has passed through, usually 10 to 50 cu ft, the paper is removed, and the weight of chromium contained in the deposit is determined by chemical methods. The quantity of air passing through the paper is measured by the air flow meter. Thus, knowing the weight of chromium collected from a known volume of air, the concentration may be calculated. It is obvious that a means of measuring air volume is essential.

Measurement of Air Volume

Air volume can be ascertained by the use of a quantity or positive meter, such as the dry gas meter used in household gas measurement, or the rate of flow or inferential meter of which the variable area (rotameter) and orifice meter are two types. The quantity meter is useful in totalizing flows over extended periods of time; however, where rates of flow of 1.0 cfm or more are to be measured and portability of equipment is a necessity, as in industrial hygiene field studies, their use is limited. The cost, weight and size of a variable-area meter having sufficient capacity to accommodate the flows frequently encountered in portable air sampling apparatus often precludes its use. The orifice meter, however, is a simple, compact, inexpensive, rugged device and may be used in conjunction with a manometer to measure a wide range of flow. The desirable qualities of this meter are attested by the fact that it is commonly used in field apparatus designed for industrial hygiene purposes.

Orifice-Variable-Area Meter

The differential manometer ordinarily used to measure the pressure drop across the orifice meter is not entirely satisfactory when accuracy and portability are primary requisites. To insure accuracy, the pressure drop and resulting manometer size must be considerable—a disadvantage. Furthermore, to provide a sufficient pressure differential a small orifice is necessary and this in turn increases the resistance of the entire sampling system. Moreover, the manometer is subject to accidental surges of flow which may draw the

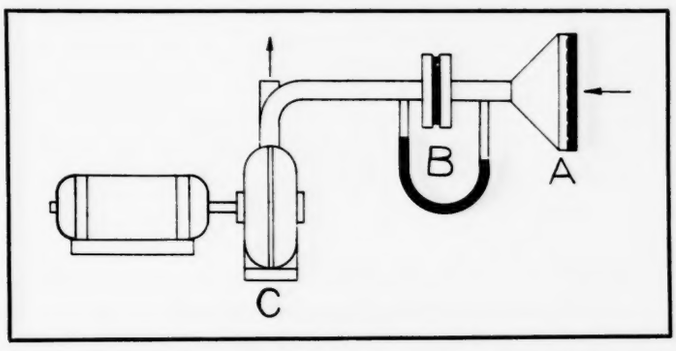


Fig. 1. Diagram of a dust sampling apparatus.

[1]Numbers in parentheses refer to bibliography.

liquid into the orifice, the vacuum pump or the sample and during the transportation and setting up of field equipment employing a manometer precautions must be taken to prevent loss of the indicating fluid.

Design and Construction

The use of a variable-area meter in conjunction with an orifice meter has been proposed (6,7,8,9) for the measurement of liquid and gaseous flow in pipe diameters of three inches or greater. The authors, employing this principal, have designed and constructed a small orifice-variable-area meter capable of measuring small air flows of the order encountered in atmospheric sampling. This combination overcomes the disadvantages of the manometer yet retains the desirable characteristics of the orifice meter and has been successfully employed for over a year. One such unit, which weighs 1½ lb and has overall dimensions of 4 by 6 inches, is illustrated in Fig. 2.

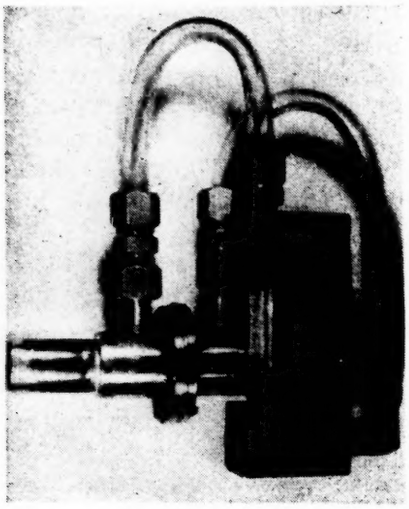


Fig. 2. Orifice-variable-area meter for 1.0 cfm flow measurement.

The orifice meter is of the usual design and consists of three monel metal parts—an orifice plate and two flanged tubes. Pressure taps are located one pipe diameter upstream and one-half pipe diameter downstream, with connections to the indicating element made with brass pressure fittings and one-fourth inch methacrylate tubing. Care was exercised to make the connections short and the turns of as large a radius as practical. A round orifice, tapered on the upstream side, proved most satisfactory and the ratio of orifice diameter to inside pipe diameter (d/D) was found to be approximately 0.50 for a flow of 1.0 cfm. The use of interchangeable orifice plates makes it possible to measure a wide range of flows using a single metering unit.

For the indicating element, a commercially available, small, inexpensive, variable-area meter is used. This particular type of meter originally was intended to measure air through pneumatic systems, thereby replacing liquid filled bubbling bottles. It is of such size and weight as to be easily held in the palm of the hand and is attached to the orifice meter by a fixture which permits the latter to be used either in a horizontal or vertical position.

Calibration

The proper orifice dimension is obtained by carefully enlarging the orifice diameter until the desired rate of flow through the orifice, for example, 1.0 cfm, results in a reading of exact unity—the mid-point of the scale of the variable-area meter. After this critical orifice dimension is established, calibration of the individual unit may be accomplished by drawing air through the orifice meter at known rates and recording the corresponding variable-area meter readings. A typical calibration curve for a 1.0 cfm unit is shown in Fig. 3. Although the range of the orifice-variable-area meter in this application is limited, (0.92 to 1.1 cfm) its sensitivity is excellent. Since industrial hygiene sampling apparatus is commonly operated at a fixed rate of flow, a metering device which will accurately indicate whether the correct flow is being maintained is of practical value.

Application

Fig. 4 illustrates a 1½ hp gasoline driven vacuum pump connected through two flow meters to twin filter paper holder sampling heads. This instrument, with its orifice-variable-area meter, was designed for the study of environmental contamination within a radius of a chromate producing plant as part of the cancer control project undertaken by the Ohio Department of Health. The accuracy of the concentration determinations depends upon a number of factors, of which correct flow measurement is one. In this particular adaptation the variable-area meter reads 1.0 with an orifice meter flow of 4.0 cfm.

Fig. 5 shows a commercially available electrostatic precipitator commonly used by industrial hygienists for the collection of dust and fume. The meter supplied with this instrument has been replaced by an orifice-variable-area unit, thereby providing greater accuracy and insuring dependability of operation. In this instance a flow of 2.0 cfm through the precipitator tube is indicated by a reading of 1.0 on the variable-area meter.

Fig. 6 depicts a single filter paper sampling head directly attached to an orifice-variable-area flow meter, the whole being supported by a tripod. Vacuum for operation is furnished by an electrically driven air

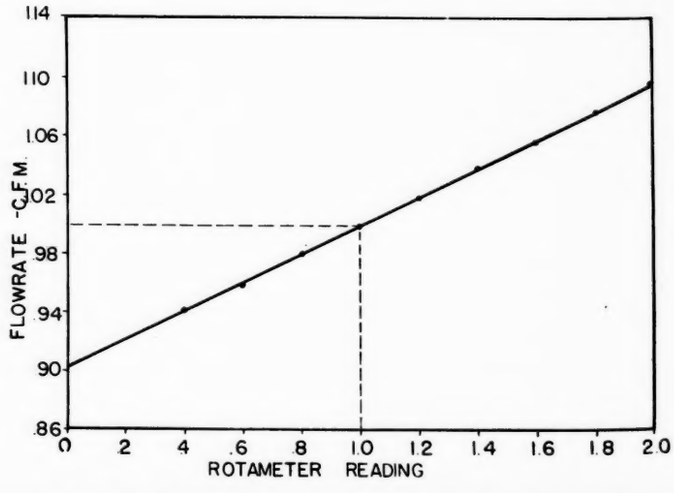


Fig. 3. Relationship rotameter reading to total air flow.

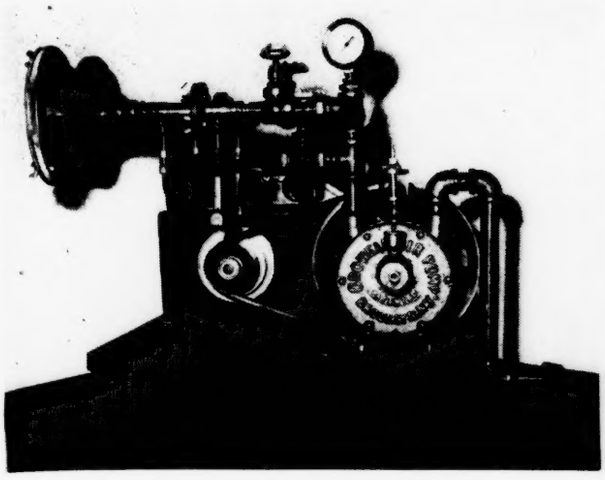


Fig. 4. Apparatus for sampling atmospheric pollution.

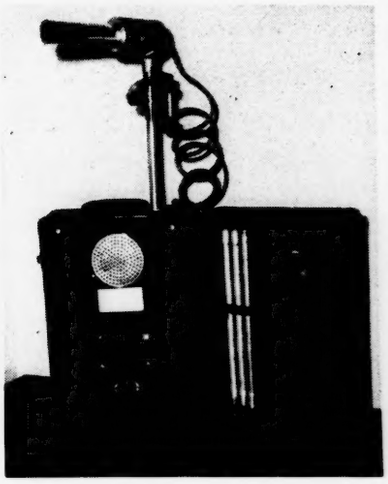


Fig. 5. Orifice-variable-area meter used with precipitator.

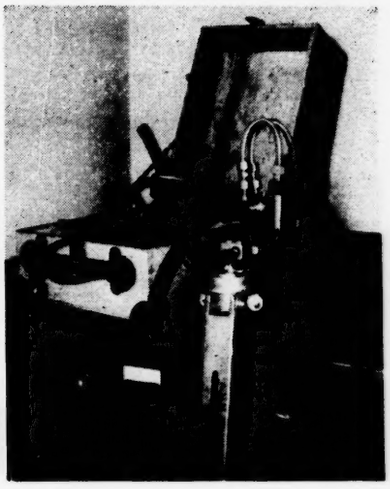


Fig. 6. Portable sampling unit with rotameter unit.

pump assembled in a single carrying case. The entire unit may be moved with comparative ease by one operator and is sufficiently rugged to withstand the unavoidable abuse encountered during the collection of air samples in industry.

Bibliography

(1) Hardy, H. L., Delayed Chemical Pneumonitis in Workers Exposed to Beryllium Compounds, *American Review of Tuberculosis*, 57:547, 1948.

(2) Eisenbud, M.; Wanta, R. C.; Rustan, C.; Steadman, L. T.; Harris, W. B.; and Wolf, B. S., Non-Occupational Berylliosis, *Journal of Industrial Hygiene & Toxicology*. 31:282, 1949.

(3) Machle, W., and Gregorius, F., Cancer of the Respiratory System in the United States Chromate Producing Industry, *U. S. Public Health Reports*, 63:1114, 1948.

(4) Studies on Environmental Cancer, *Cancer News*, 3:4, 1949.

(5) U. S. Public Health Service, Air Pollution in Donora, Pa., Preliminary report. *Federal Security Agency, Bulletin 306*, 1949.

(6) Munch, R. H., Instrumentation, *Industrial and Engineering Chemistry*, 40:99A, 1948.

(7) Fischer and Porter Company, Oriflowrator, *Catalog Section 39-C*, Hatboro, Pa.

(8) Mitchell, F. A., Measuring Flowrate of Corrosive Solutions, *Chemical Engineering*, 54:146, 1947.

(9) Gibaldo, F., By-pass Rotameter Employs Simple Pilot Tube, *Chemical Engineering*, 55:126, 1948.

Smokeless Furnace Requires Minimum Operating Attention

New developments in the Illinois smokeless furnace, which include a 2-stage barometric draft regulator and a semi-automatic hold-fire damper, have resulted in a hand-fired smokeless furnace for the home that requires attention but once a day. Twenty-six field installations have functioned well. Details of this design were given in a paper presented at the 1949 annual meeting of the American Society of Mechanical Engineers in a paper by Julian R. Fellows, professor of mechanical engineering, and John W. Norris, vice president, Lennox Furnace Co.

By actual record, the furnace in the home of one of the paper's authors was fired 71 times during the last 105 days of the 1948-9 heating season, and it was never fired more than 6 times in any week. During the period January 29 to May 13, 1949, a coal fire was maintained through four consecutive days during which the outdoor temperature reached 89, 88, 90 and 90F without noticeable heat being delivered to the house. Sufficient coke was available to revive the fire without rekindling.

Fuel consumption was low. In a unit with a body diameter of 24 inches, the combustion rate varied from a minimum of one pound to a maximum of 10-12 lb per hour while maintaining a cold weather type of fuel bed. When a spring and fall type of fuel bed with a layer of ash is maintained on the grate, the combustion rate can be varied from less than 0.35 to 6 pounds per hour.

While an effort has been made to develop a fully automatic hold-fire damper, as yet it has not been possible to produce a unit having entirely satisfactory operating characteristics under all the many different conditions of operation which may be encountered.

Very close regulation of the house temperature is obtained when the dampers are controlled by a sensitive thermostat of the heat anticipating type.

The two-stage barometric damper was developed to avoid duplication of experiences with earlier models with which it was possible to obtain a reversal of chimney draft during one or more days of warm weather.

Executive office building, Kellogg Company, Battle Creek, Michigan.

Dehumidification Cuts Comfort Conditioning Load

GEORGE WHYBREW
Chief Engineer, Giffels and Vallet, Detroit

and

WILLIAM KITCHEN
Project Engineer, Kellogg Company, Battle Creek

AIR conditioning installed in the executive office building of the Kellogg Company's main plant at Battle Creek, Michigan, features control of humidity as the primary objective, rather than control of temperature as in conventional systems. Besides greatly improved personal comfort, Kellogg reports that former trouble with automatic business machines has been eliminated. This trouble resulted from the tendency of paper and cards to absorb moisture from damp air, causing them to stretch and curl up so that it was difficult to run them through the machines.

The air conditioning system has been designed to simulate the climate of Arizona which is not particularly cool, but where the heat is not oppressive because the air is very dry. In dry air, the human body is its own evaporative cooler. The hotter and drier the air, the more the body perspires, and the more evaporation, and, consequently, more cooling takes place. Since this human cooling device depends on quick evaporation, it cannot function well in humid air where evaporation is slow.

Moisture Control Units

The Kellogg air conditioning system, engineered by Giffels and Vallet, Detroit, consists essentially of two

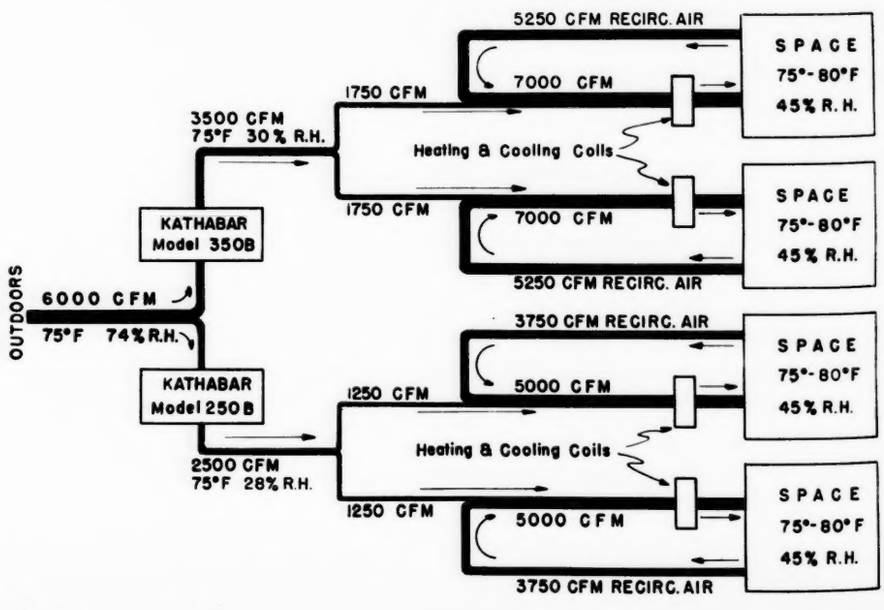


Fig. 1. Schematic diagram shows distribution of conditioned air to the four sections of the office building. Kathabar units produce 30% R.H. air. Balancing with recirculated air through heating and cooling coils maintains 45% R.H. in conditioned space.

Kathabar humidity control package units together with Multitherm units for summer cooling and winter heating. The arrangement is illustrated schematically in Fig. 1.

The spaces indicated in this diagram have a total volume of 120,000 cu ft. This includes a number of private executive offices, each of which is equipped with special grilles located under the windows, fitted with dampers and individual blowers so that the occupant has control of both total flow and temperature of the air. Air is supplied to the larger offices by draftless type grilles in the ceiling.

In summer, the entire cooling load is handled by 57F well water circulated through the heating and cooling coils indicated in Fig. 1. With this arrangement, the inside temperature is held to a comfortable 80F during the hottest weather. Outside temperatures seldom get much above 95F.

A comparatively small inside-outside temperature difference plus an abundance of cool circulating water at 57F eliminates the need for any mechanical refrigeration for cooling. If cooling water were not available, about 35 tons of mechanical refrigeration in addition to the Kathabar units would handle the sensible cooling part of the load. Using cooling coils

Fig. 2. Steady humidity level in automatic business machine room has greatly improved machine efficiency. Previously, cards and paper absorbed moisture from damp air in summer and would not run through machines properly.

alone to provide summer conditions of temperature and humidity comparable to those now maintained in the building would require 80 tons of refrigeration.

In winter, the natural humidity drops so that the Kathabar system is not needed. During this part of the year the Kathabar is simply turned off, and the incoming air stream continues to be blown through it. Before being brought into the plenum chamber, the incoming fresh air is passed through steam heated tempering coils, after which it is mixed with the recirculated air and passed through the main Multitherm steam heaters.

Temperature in both summer and winter operation is independently controlled for each of the four zones. This is done in summer by regulating the amount of

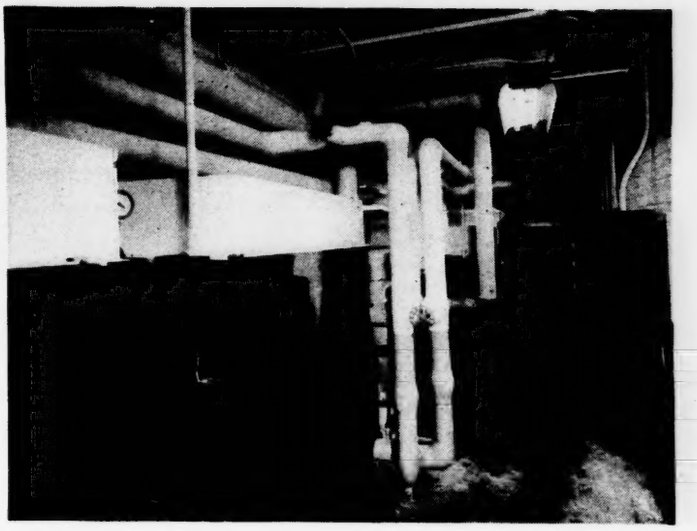


Fig. 3. Two Kathabar Package Units control humidity throughout the entire building. On a normal summer day, they remove a dozen large drums of water from the air.

circulating water passed through each of the cooling coils, and in winter by regulating the amount of steam supplied to the coils. Control of humidity is accomplished by maintaining the absorbent solution at a constant temperature so that its ability to absorb moisture will remain constant. This results in efficient operation of the Kathabar and holds inside conditions between 45% and 50% R.H. under any normal outside conditions. A finer degree of humidity control could be accomplished by the use of a humidistat to control the solution temperature of the Kathabar, but such fine control is usually necessary only in certain very critical industrial processes, and the few grains that the moisture varies at Kellogg is not noticeable.

The outside conditions indicated in the schematic flow diagram (Fig. 1) do not approach the maximum design conditions for the system. However, this air carries 96 grains of moisture which makes it feel oppressive even at such a moderate temperature as 75F. A system which would cool this air to 70F without removing any of its moisture content would bring about an actual increase in the relative humidity to 87% at the cooler temperature. While the system at Kellogg's does not cool the humid 75F outside air at all, it does transform it to a dry 75F, which is very comfortable.

Utilities

Utilities required for operation of the system in summer are the 57F circulating well water to control the temperature, about 500 pounds of low pressure steam per hour for regeneration of the absorbent, and about 10 hp of electric motor power for the entire system, including blowers (but exclusive of the circulating water pumps which are used to supply many other processes besides the air conditioning). The absorbent used is Kathene solution, composed largely of lithium chloride. Besides being an efficient absorber of moisture, this solution removes smoke and dust from the air, while leaving no odor of its own, and has a slightly antiseptic effect.

Church of Christ The King, Seattle, presents unique exterior and unusual layout for . . .

Radiant Heat in a Modern Church

RADIANT heating with air conditioning is featured in the recently dedicated Romon Catholic Church of Christ The King in Seattle, Washington.

The new church, which is of decidedly modern architectural conception, stands on a hillside where it is well exposed to the weather. The entrance faces south. While the climate is considered mild the year around, the design basis for engineering the heating is for 70F indoors with an outdoor temperature of 10F and a 15-mile per hour wind, which is considered most extreme in this area.

The entire building is of reinforced concrete, with a concrete slab floor and a 60-ft concrete bell tower. More than 6,900 ft of Rayduct, Bethlehem Steel Co.'s steel pipe especially made for radiant heating, is laid in all-welded coils in the floor. This floor is constructed of four inches of gravel, one inch of grout, a waterproof membrane of two layers of 30-lb felt, hot mopped down, an insulating slab of four-inch vermiculite concrete on which the Rayduct pipe is placed, and a poured heat slab of three inches of regular concrete.

A congregation of 550 persons can be seated in the semi-circular nave of the building, not one of whom will be more than 50 ft from the altar. The entire church is radiant heated except for the lavatories and working sacristy, which are over the boiler room and are heated with convectors rated at 22,000 Btu per hr.

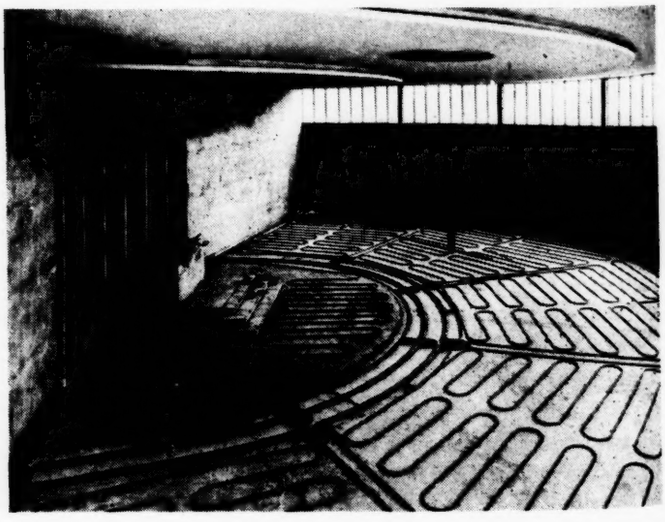
Total floor area is 7,000 sq ft and there is an approximate air volume to be heated of 124,000 cu ft. There are, in all, four rooms: Priest sacristy, working sacristy, crying, or mothers' room, and the semi-circular nave, which has a choir pit located behind the altar and between the two sacristies. Over the choir pit is a fan room where the air conditioning system is located. This system can circulate outside air or reheated air at 12,500 cfm and can also be used to temper the air. It can furnish up to 112,000 Btu per hr.

Hot water for the radiant heating system is supplied by a Ray oil burner operating on No. 5 oil. Sarcotherm mixing valves and controls are used throughout and each room has its own balancing valve and shut-off valve. The nave is divided into five wedge-shaped pieces, each having four closures with their own balancing valves.

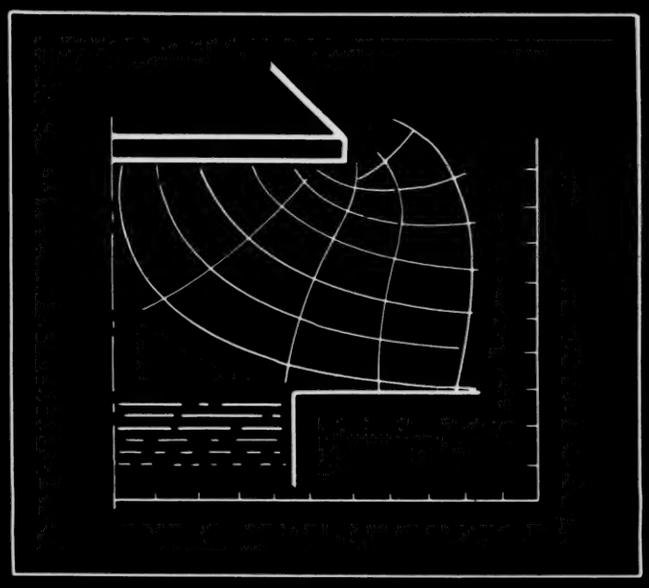
The shut-off valve for the nave is located in the basement. Expansion strips separate each wedge-shaped section to take care of expansion and to insulate each section. All pipe mains have expansion loops wherever they cross expansion joints so that all expansion and contraction occurs in one place,—along expansion joints. The entire radiation panel is rated at 375,000 Btu per hr.

Unique in its semi-circular construction, the church has the added feature of circumferential clerestory lighting through clear glass windows.

Paul Thiry, Seattle, was the architectural engineer. The radiant heating system was installed by L. G. Massart Plumbing & Heating Company, Seattle. Engineering and design other than that of Mr. Thiry was done by the Austin Co., Cleveland, Ohio.



Wedge-shaped panels have four closures each.



CANOPY EXHAUST HOODS

F. A. THOMAS, Jr.

Actual measurements have been made of what happens to air flow characteristics when a plane surface barrier is introduced at various distances in front of and parallel to the opening of a canopy hood. Values are checked against DallaValle's original rational values for this type of application and a modification of DallaValle's design equation is derived.

Design Characteristics of

Canopy Exhaust Hoods

FRANK A. THOMAS, Jr.
Industrial Hygienist, Atomic Energy Commission

THE design of canopy type hoods—that is, the determination of the air flows such hoods should handle—is usually a hit-or-miss proposition. An approximate formula often used is one developed by DallaValle, $Q = 1.4\ P\ X\ V$ where Q is the number of cubic feet per minute to be handled by the hood, P the perimeter in feet, X the distance of the hood face from the source of contaminant in feet, and V is the velocity in feet per minute required to control the contaminant. For vapors and gases the value of V varies from 40 to as high as 75 fpm. For large hoods, therefore, the selection of the proper control velocity is important since the choice of either 40 or 75 fpm influences not only the size of fan needed, but also the air turnover in the room in which the hood is located. Reliance on DallaValle's formula without some knowledge as to the general velocity characteristics of hoods can lead to overdesign, or, indeed, to inadequate design in cases where the hood is suspended a large distance above the contaminating source.

While there is a relatively large body of information on the flow characteristics of freely suspended hoods without any forward obstruction to the opening, no data are available regarding velocity characteristics of exhaust hoods as used in industry which often operate with rather extensive obstructions in the zone of hood influence. Such is the case with canopy type hoods which can be regarded as hoods with a plane barrier or obstruction at some distance from the opening. Other than DallaValle's more or less empirical data as reported in *Exhaust Hoods* (Industrial Press, 1945) it may be said that thus far no experimental attempt has been made to evaluate hoods with plane barriers. This paper attempts to fulfill this need. The procedure used for this analysis follows that developed by DallaValle for unobstructed hoods for reasons explained in another paragraph.

Types of Canopy Hoods

While the name canopy hood is given to a hood that is suspended above a process for the removal of air contaminants, this is a limited definition. In general, the following may be listed as variations of the canopy hood:

(1) Freely suspended over the process
(2) Mounted on a wall
  (a) Three sides open
  (b) Two sides open

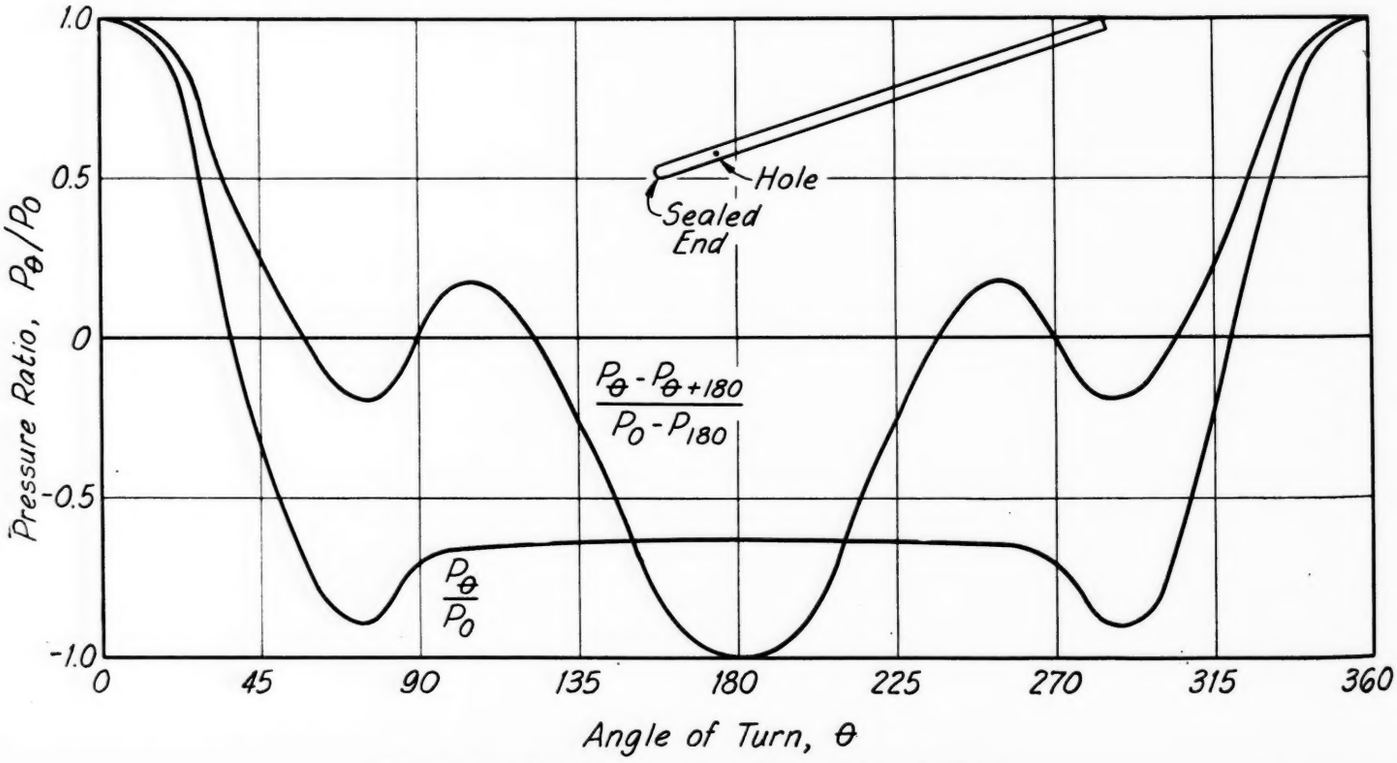


Fig. 1. The Fage tube and its rotational characteristics.

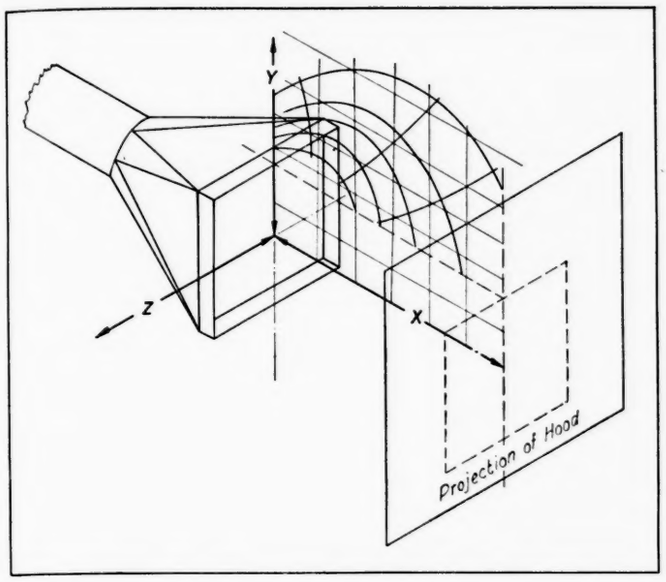


Fig. 2. Schematic diagram of setup.

(3) Built as a part of the equipment for the process (75% or more of the periphery closed)
(4) At an angle to the process

Only the first type is covered in this paper, but since the discussion deals with the simple elements of flow into an opening under suction, three geometric configurations are included, i.e., round, square, and rectangular openings.

A summary of previous work shows DallaValle to be one of the first to investigate the flow of air into openings under suction. His work has been the most widely accepted to date. He studied unobstructed openings only, but applied his findings rationally to several industrial applications by anology to the method of images used in capacitance calculations in electrical theory (see *Exhaust Hoods*, J. M. DallaValle, Industrial Press, 1945, p. 13) and certain mathematical techniques. Silverman checked his data but his results do not agree with DallaValle's as closely as expected (see Centerline Velocity Characteristics of Round Openings Under Suction, *Journal of Industrial Hygiene and Toxicology*, Sept., 1942, pp. 259-266).

The techniques used by DallaValle and Silverman in their respective studies differed. DallaValle used a modified cylindrical Pitot tube in conjunction with a sensitive micromanometer for obtaining velocities throughout a diametric plane, while Silverman used the thermometer-anemometer to determine the variation of velocity along the centerline only. DallaValle's method produced instantaneous point velocities but Silverman's gave an integrated velocity over a much larger area. Both of these devices have one common disadvantage in that the measurement of velocities below 150 fpm becomes very difficult and requires great care. The thermometer-anemometer has an additional disadvantage in that it does not give a directional reading. Because DallaValle's method is faster and measures point velocities—and is perhaps more accurate—it was decided to follow his procedures in determining air velocity distributions.

Cylindrical Pitot

The cylindrical Pitot tube (Fage tube) used in this investigation is illustrated in Fig. 1 and consists of a ⅛-inch diameter brass tube with a 1/64-inch hole near one end. The end nearest the small side hole is sealed off and the other end is connected to a sensitive manometer. As may be seen in Fig. 1, the reading obtained with the tube is quite sensitive to the direction in which the hole is pointed with respect to the air flow. Fig. 1 is a plot of the ratio P_{theta}/P_0 of the pressure taken at an angle θ to the flow, to the pressure of the $\theta = 0$ position, that is, when the tube opening is parallel to the flow. The ratio

$$\frac{P_{\text{theta}} - P_{\text{theta}+180}}{P_0 - P_{180}}$$

is also plotted, and gives the reading identical to a two compartment tube similar to that used by DallaValle in his studies.

The Fage tube was calibrated against the standard Pitot-static tube and found to be 1.70 times as sensitive as the Pitot tube for velocities in excess of 150 fpm. Below 150 fpm the tube factor increases. Velocity head readings were made with a Wahlen gage, a differ-

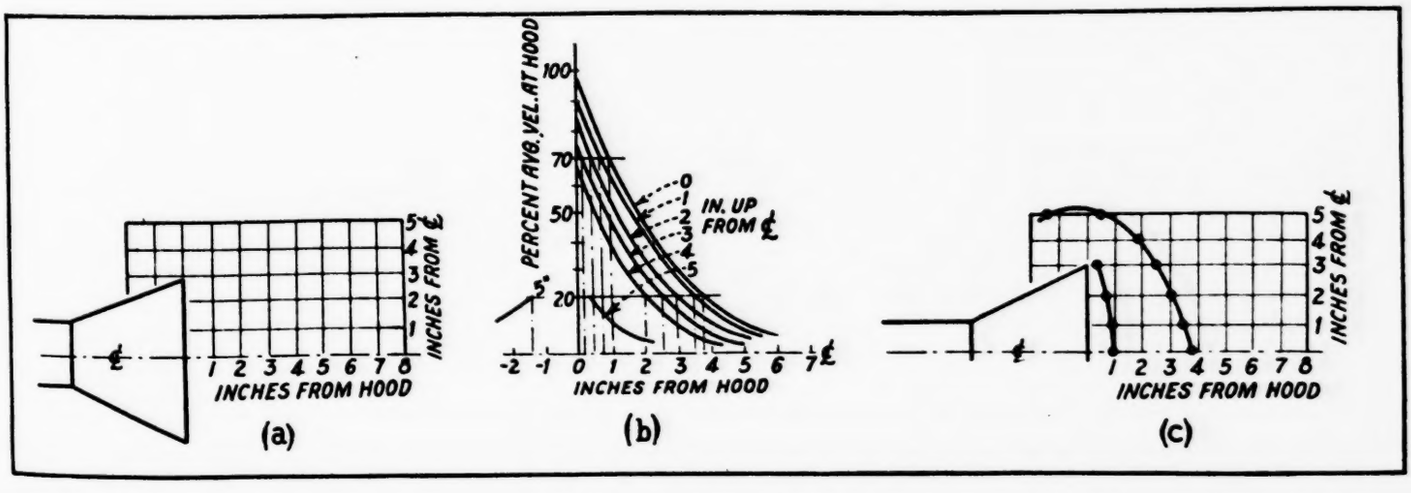


Fig. 3. Method of developing velocity contours: (a) coordinates at which readings are made; (b) readings are plotted as shown, ordinates representing percentage of velocity at opening and abscissae the distance from the opening; (c) velocity contours as plotted.

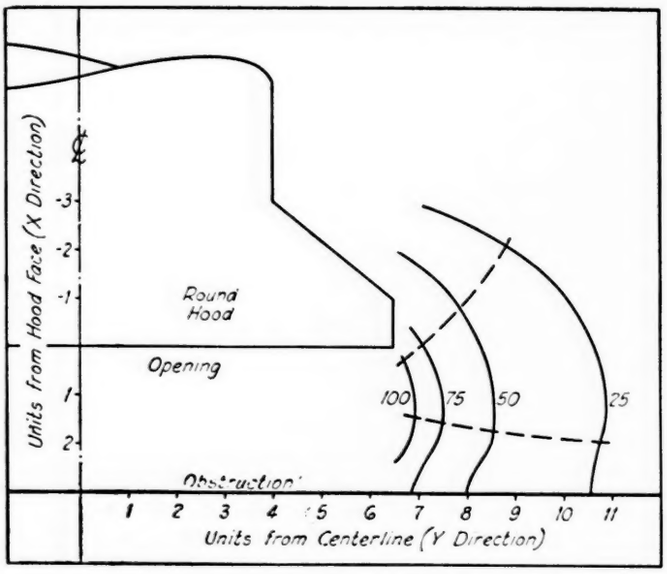


Fig. 4. Velocity contours as percent of face velocity.

ential manometer capable of measuring deflections as low as 0.0005 inches water.

The experimental setup is arranged as in Fig. 2. A plane obstruction is placed parallel to the opening and at various distances from the opening. The velocity tube is located so that the hole in the tube is always in the plane perpendicular to the centerline of the opening and the midpoint of the hood edge. Data are taken only in the area outside the confines of the opening. This procedure can be justified when the reader remembers that most processes which are controlled by canopy hoods have a space between the opening and the surface of the tank which is sometimes too hot for the convenient study of air flow. It is not the air flow within the confines of the hood that is of primary interest, but the movement of air into the controlling

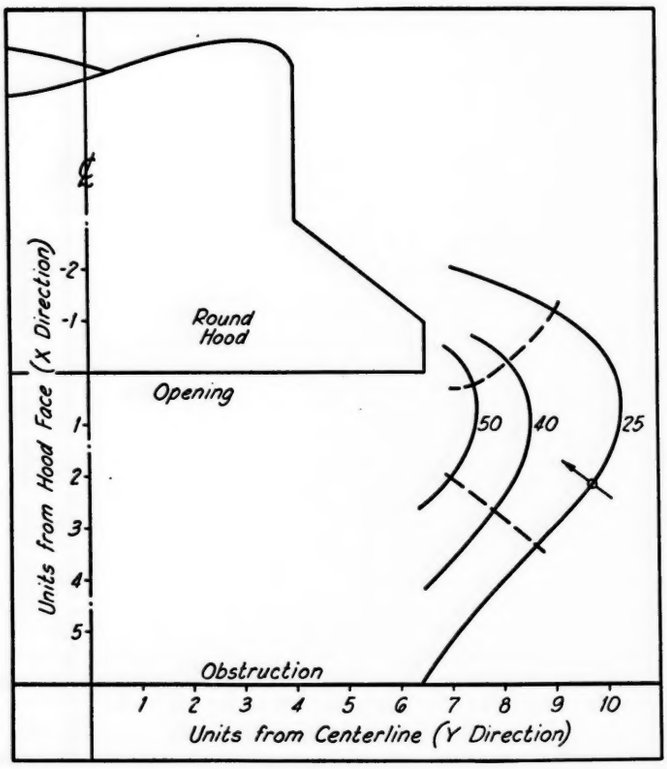


Fig. 5. Velocity contours.

area and that of the edge of the tank or surface. Some regulatory codes specify a velocity at a particular point or an average velocity but none of these codes prescribes the conditions for obtaining it.

The data obtained by making traverses with the tube in the zone influenced by the hood are plotted as a series of curves, one series for each position of the plane obstruction.

Fig. 3 is taken from *Exhaust Hoods,* in which it is numbered Fig. 7. The following description of the method employed is also taken from that publication.

"Readings with the tube are taken horizontally, outward from the opening at each level above the center line. (Fig. 3*a*)

"Each reading so obtained is then plotted as shown in Fig. 3*b*, the ordinates representing the percentage of

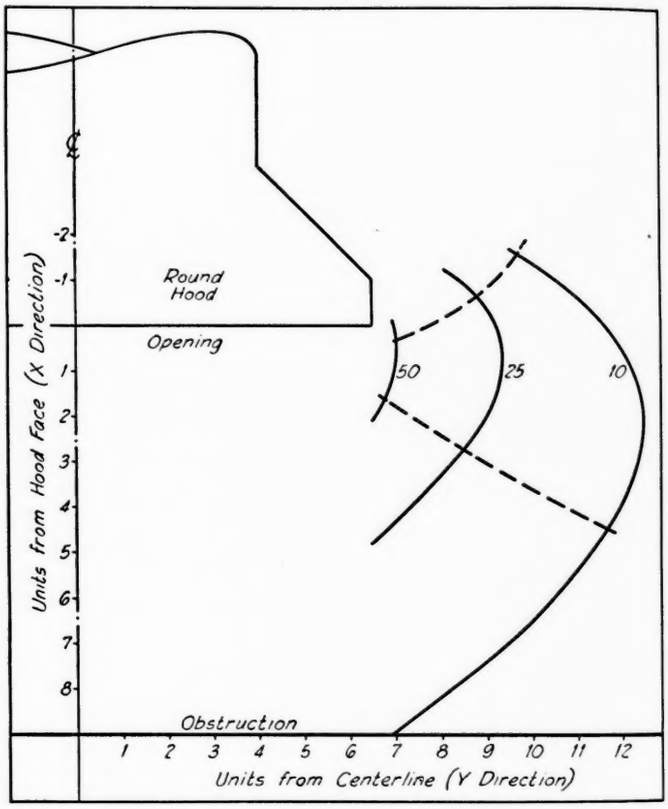


Fig. 6. Velocity contours.

velocity at the opening and the abscissae the distance from the opening. The velocity contours may be determined from these curves. For example, to determine the contours of velocities equivalent to 20% and 70% of the average velocity at the face of the opening the values of the abscissae corresponding to the intercepts are obtained for the various velocity curves, as in Fig. 3*b* and plotted as in Fig. 3*c*."

The unit system of reference has been adopted throughout this discussion, in accordance with the method employed by previous investigators. The unit system permits two hoods of the same shape to be compared by dividing each into the same number of units, i.e., a hood 39 inches in diameter may be compared with the reference hood which is 13 inches in diameter by dividing each into 13 units. This makes a unit equivalent to one inch for the smaller hood and three inches for the larger hood.

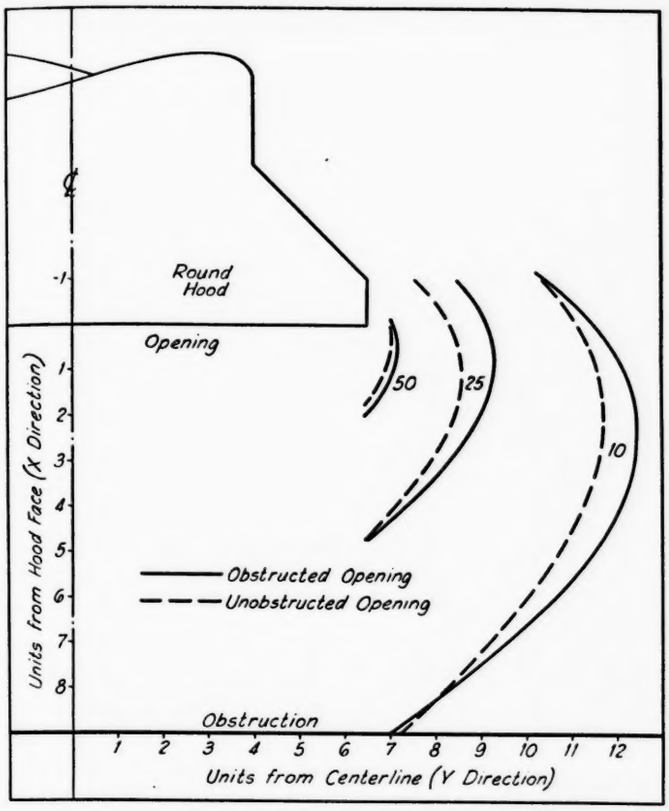


Fig. 7. A comparison between the values obtained by DallaValle for an unobstructed round opening and the values obtained by the author for an obstructed round opening.

Round Openings. Fig. 4, 5, and 6 show velocity contours for various positions of the obstruction from a round opening. It is seen upon inspection of the three figures that the velocity at the obstruction for $Y = \frac{1}{2} W$ (where W is hood width or diameter and Y is distance from centerline of hood) changes rapidly with an increase in distance between the hood and obstruction. This, of course, is expected. There is also a change in the extent of the velocity contours for the Y-direction but this change is not so great as that in the X-direction.

Fig. 7 is a comparison between the values obtained by DallaValle for the unobstructed round opening and the values obtained by the author for a round opening nine units from a plane obstruction (a distance equivalent to 0.7 of the diameter of the opening). It is seen that there is but little difference between the contours and therefore appears that distances greater than $\frac{3}{4}$ the hood diameter between the opening and the controlling surface are not feasible for the canopy hood. In other words, the effect of the controlling surface on the air flow is nil for excessive distance, for in order to obtain a reasonable velocity at the controlling surface it is necessary to exhaust large quantities of air, but the obstruction is favorable for short distances since less air is required for the same amount of control.

An example of the use of the curves follows. Assume that it is desired to find the velocity at a point 54 inches out in the Y-direction and 12 inches in the X-direction for a hood 6 ft in diameter and 2 ft 10 inches from a tank recessed in the floor.

Using the unit system it is found that the situation is similar to that found in Fig. 5 where hood diameter is divided into 13 units. The coordinates are then

$$Y = \frac{13}{6 \times 12} \times 54 = 9.35 \text{ units}$$

$$X = \frac{13}{6 \times 12} \times 12 = 2.13 \text{ units}$$

The velocity at this point is 25% of V_o, the average velocity at the opening and the direction of flow (normal to the velocity contour) makes an angle of 54° to the X-axis toward the opening.

Square and Rectangular Openings

Hood shapes which are not circular do not yield to simple analysis. Contours and stream lines for the circular opening may be used to form surfaces of revolution by merely rotating them about the centerline axis of the opening. This obviously cannot be done for the square, rectangular and other geometric configurations. However, a useful approach is to consider only the centerline plane perpendicular to the midpoint of the sides of the opening (see Fig. 2). By using the method previously discussed, Fig. 8, 9, 10, 12, 13, and 14 are obtained.

Fig. 8, 9, and 10 are derived from a square hood of twelve units to the side and show the effect of having the obstruction placed at ¼, ½, and ¾ the hood width from the opening.

The contours predicted by DallaValle for the condition found in Fig. 9 are compared in Fig. 11 with results obtained by the author. The discrepancies are greater in the higher percentage velocity ranges than can be charged to experimental technique. It is believed that the mathematical technique breaks down in this region due to the formation of a vortex within the confines of the hood and obstruction. By simple mathematical comparison, using Fig. 8 or 11 as the example, it is seen that the cross-section of the hood opening is 144 square units (12 x 12). The perimetral area between hood and obstruction is 4 x 12 x 3 = 144 square units. Thus the average velocity at the

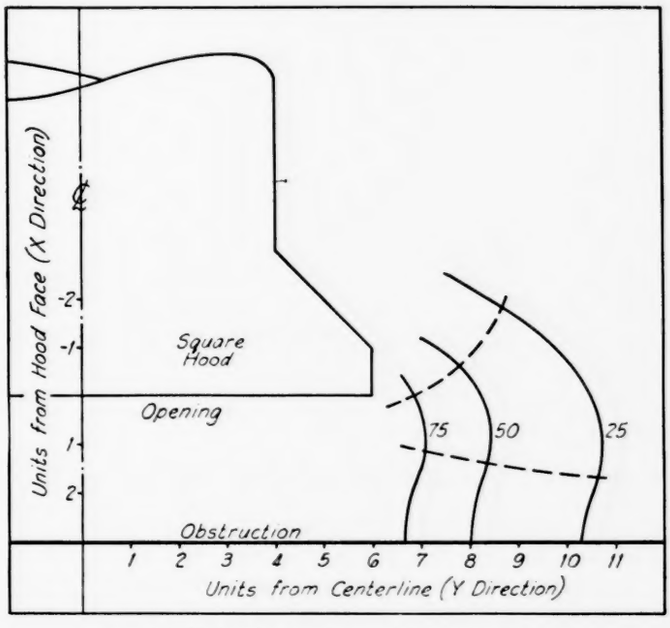


Fig. 8. Velocity contours for square hood.

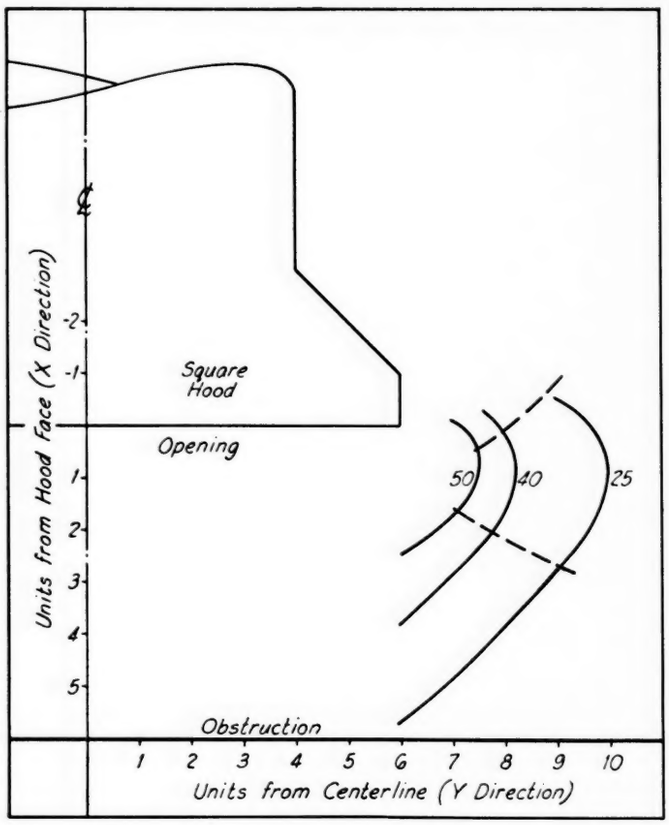


Fig. 9. Velocity contours as percent of average face velocity for square hood. Obstruction 6 units from hood face.

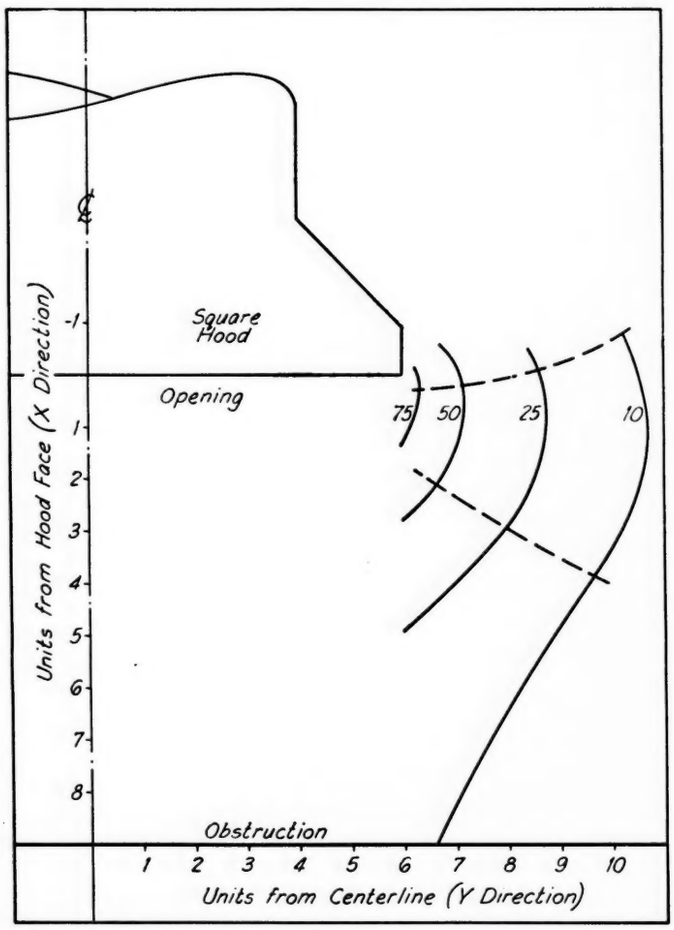


Fig. 10. Velocity contours for square hood with obstruction 9 units from face.

face of the hood and at the perimetral opening are the same. The contours as predicted by DallaValle are checked by experimental data for values less than 40% of average face velocity, however.

Rectangular hoods impose a problem quite different from those of the square and round hood since two centerline planes must be presented in order to give a complete picture of the hood performance. However, only the results of the study of the long side are presented in Fig. 12, 13, and 14 since it is the object of primary interest. The particular hood has a 2:1 ratio of sides.

There is a great difference in the magnitude of the velocity contours for equal distances out from the short and long sides. In control of dust and fume problems this creates a disadvantage in that a larger quantity of air is required to adequately control the contaminant. If a velocity which is sufficient to control the contaminant is found at the midpoint of the long side, an inadequate velocity will be found at the short side. And conversely, an adequate velocity at the short side

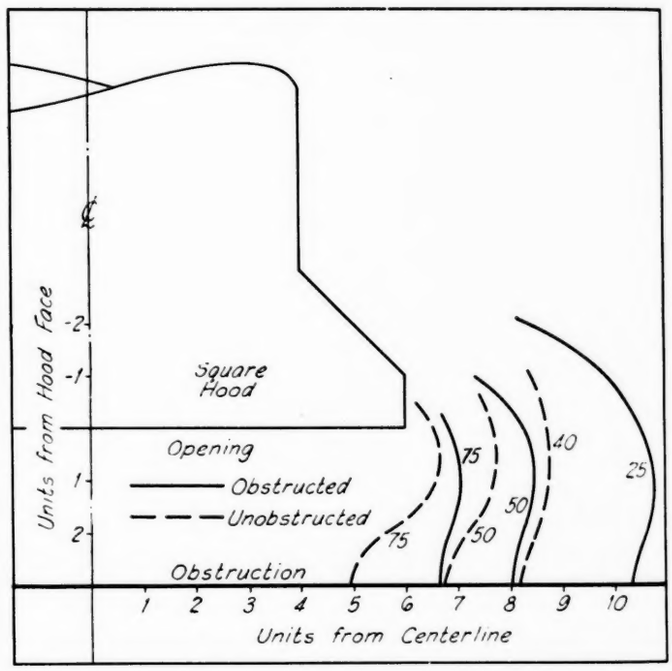


Fig. 11. Comparison between the values predicted by DallaValle for a square opening ¼ width of the hood opening from the obstruction and the values obtained by the author.

will be found in conjunction with a much higher velocity along the long side.

In most cases it is the process which determines the type of ventilation control to be used. If the freely suspended canopy hood is a satisfactory solution to the problem, the shape of hood is determined largely by the shape and type of equipment used for the process. However, should there be some latitude in the choice of hood, the round and square hoods should be given preference over the rectangular due to more certain control and a smaller quantity of air removal needed.

Assuming that the velocity at the tank or surface edge ($Y = W/2$) is the most important in determining effectiveness of control, it is desired to obtain an equation relating position and velocity with hood size and

quantity of air removed. By plotting on logarithmic paper $100V/V_o$ as the ordinate and X/W as the abscissa, a straight line relation is obtained when

X is taken as distance between hood and obstruction in feet

W is hood width (or diameter) in feet

V is the velocity at X, $Y = O$

V_o is the average velocity at the hood opening.

After obtaining the exponents, the equation is simplified to

$$Q = 14.5\ V\ W^{0.19}\ X^{1.81} \qquad (1)$$

where Q is expressed in cubic feet per minute.

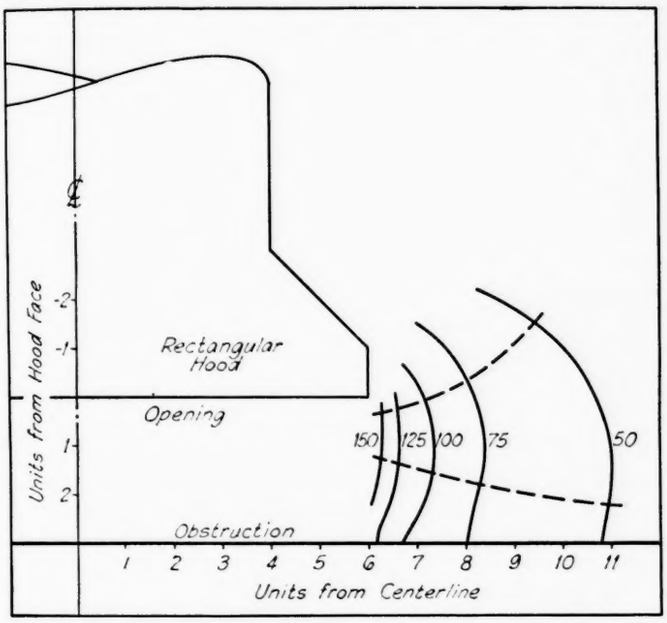


Fig. 12. Velocity contours, expressed as percent of average velocity at hood opening.

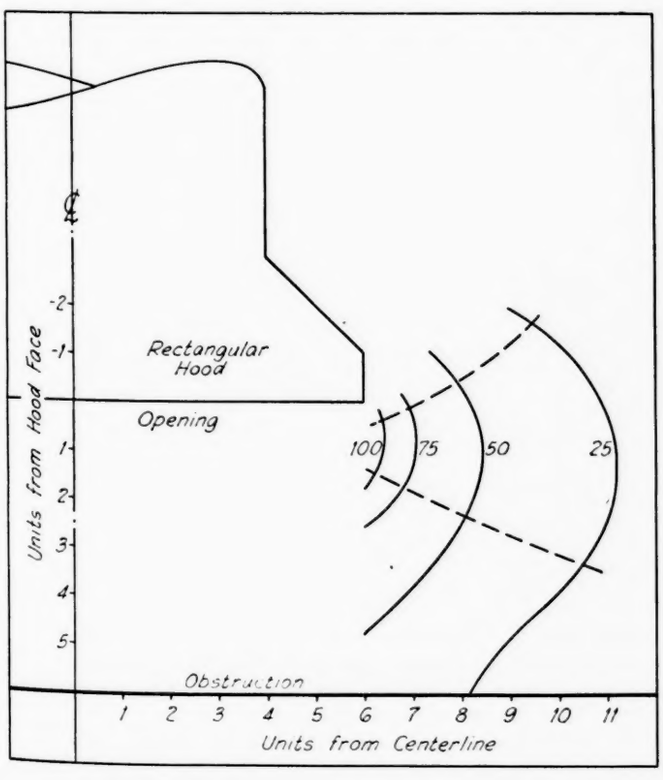


Fig. 13. Velocity contours for rectangular hood.

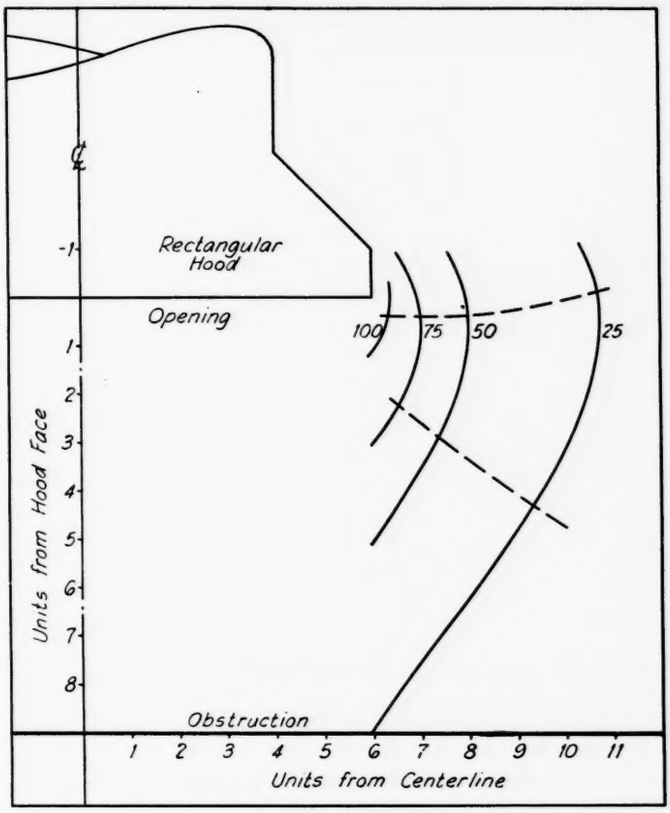


Fig. 14. Contours with obstruction 9 units from rectangular hood openings.

The above equation is applicable only to round and square openings and does not fit the rectangular opening.

DallaValle developed the general equation

$$Q = 1.4\ P\ X\ V \qquad (2)$$

from field studies. P in this equation is the perimeter of the tank or controlling surface and does not exceed the dimensions of the opening, X is the distance from the hood to the tank and V the air velocity required to control the contaminant.

DallaValle's equation, though easier to use, is limited in its application as will be shown in the following table:

TABLE 1. COMPARISON OF TWO EQUATIONS
Where V = 100 fpm; W = 1 foot

X	Q =	
	1.4 P X V	14.5 V $W^{0.19}$ $X^{1.81}$
¼ W	140	117
½ W	280	413
¾ W	420	860

Thus, DallaValle's equation gives results which are too low for large values of X/W.

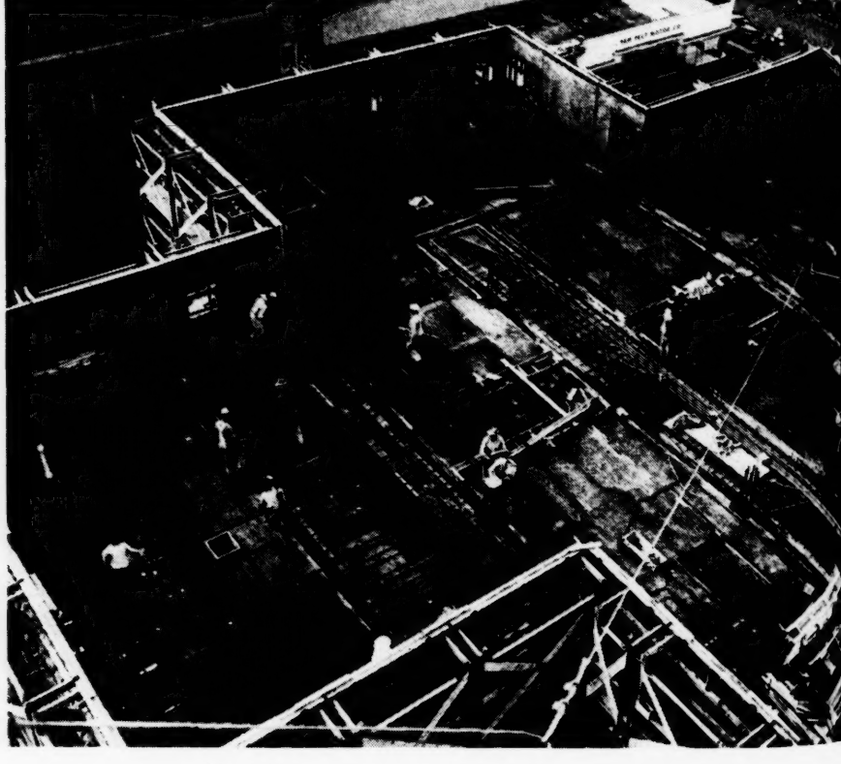
The limiting value of X up to which his equation applies can be obtained by equating the two equations and solving for the ratio X/W. It is found that the two equations agree when $X/W = 0.283$. In general, if the ratio is less than 0.300, either Equation 1 or 2 may be used without seriously impairing the effectiveness of the hood, but for values of X/W in excess of 0.300, Equation 1 is suggested.

O. J. Prentice (right), 83-year-old advertising manager of the C. A. Dunham Co., manufacturer of heating equipment and engineered heating systems, has resigned to go into business for himself as an advertising consultant. Mr. Prentice, known around town as "Chicago's oldest active huckster," has just completed his 56th year in advertising —the last 30 of which have been with Dunham. Pictured with him: NBC staff announcer Elizabeth Hart, who interviewed Mr. Prentice for her WMAQ show "Elizabeth Hart Presents," and F. E. Schmidt, vice president of Dunham.

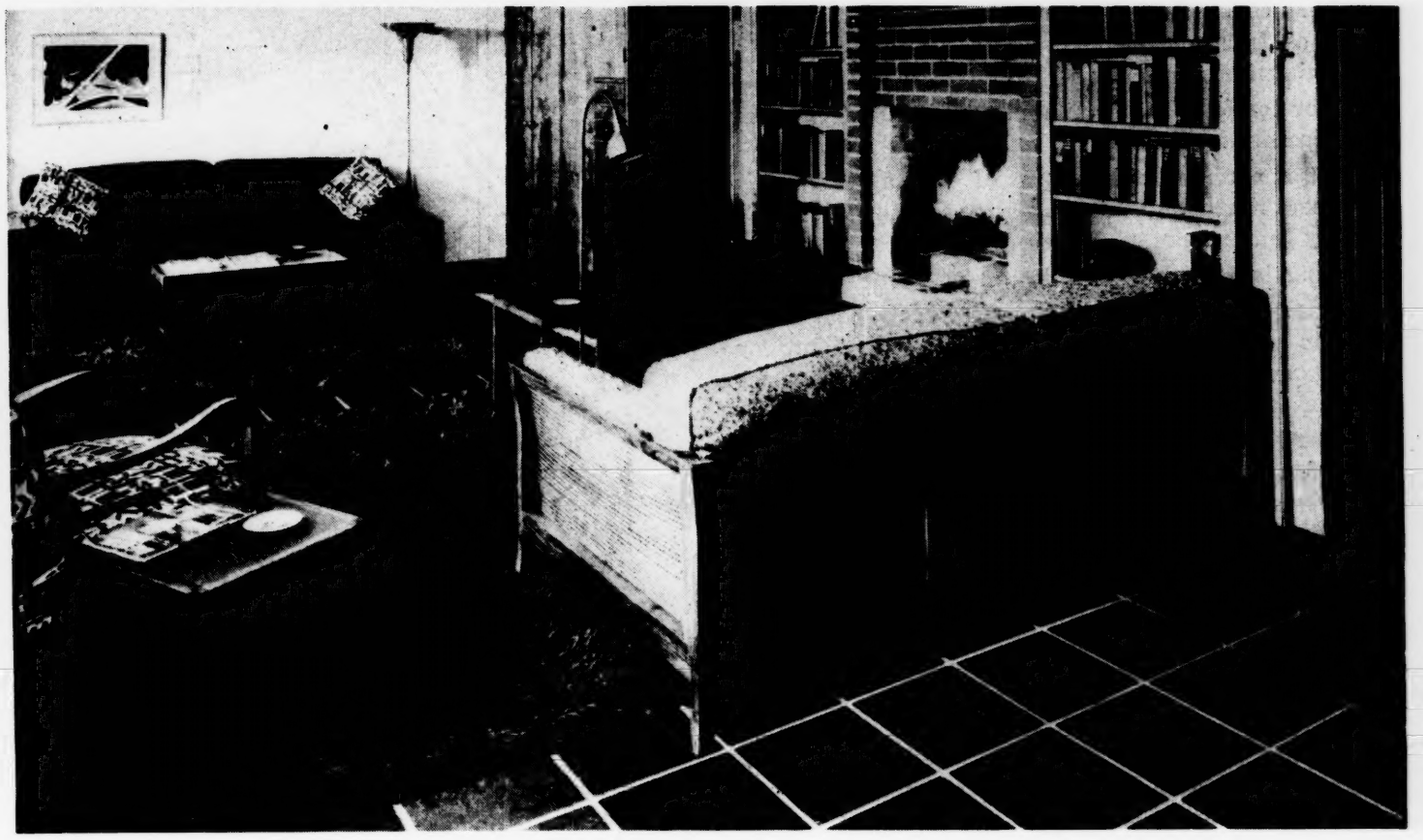
Operator of this giant electrically-powered crawler-type shovel handling hot slag from a Pittsburgh steel mill is protected from excessive heat and fumes by an air conditioning unit mounted atop the cab. The cab-cooling equipment, a development of Dravo Corp., supplies the cab with 400 cfm of conditioned air, holding inside temperature at approximately 80F. Molten slag is poured into heap at 2800F.

Picture Paragraphs

(Right) About 35 miles of steel pipe, laid in the concrete ground slab and 18 upper floors, will heat Grosvenor House, a new apartment building going up in Seattle, Washington. This is the largest single installation of Bethlehem Steel Co.'s Rayduct, special steel pipe for radiant heating, in the United States; in fact, it is said to be one of the largest radiant heating installation to date in the country. The building houses 370 apartments, 20 stores, and a three-story garage. In addition, provisions are made for pumping cold water through the pipe grids for summertime cooling. Three converters supply tempered water according to need, one for floor coils with less than 100 sq ft of heating surface, one for south exposure apartments with 200 sq ft of heating surface, and one for north exposure apartments with 400 sq ft of heating surface.



(Left) New passenger cars, 152 in all, being built for the Chesapeake and Ohio Railway Co. by Pullman-Standard Car & Manufacturing Co., and soon to go into service, will be equipped with Dorex activated carbon air recovery panels. Four of these panels are installed in the air conditioning system's plenum, making a total of 608 units, according to the manufacturer, W. B. Connor Engineering Corp., New York. By riddling the air recirculated within the car of odors, the air recovery panels improve air quality.



Forced Warm Air Used in Radiant Tile Floor Panel

A NEW method of radiant heating using warm air forced through channels of special floor tile has been developed by engineers of the Clay Products Association. Called RadianTile, the method involves use of four patented shapes of fireclay or shale tile shown in Fig. 1. Two of these shapes are floor blocks and two are clay ducts.

Each floor block has three channels through it and forms a square foot of finished floor surface suitable for residential, commercial, laboratory and other types of building. When laid end to end as a floor, RadianTile blocks line up to form continuous and uninterrupted channels for the full length or width of the room. A space of about $\frac{5}{8}$ inch is left between each RadianTile block when it is laid. This space is later filled with cement mortar. Special sleeves (Fig. 2) connect the ducts between each block to prevent mortar from entering the channels. When the floor is finished, the channels form a closed system.

Forced warm air from the heating unit is carried to the floor ducts through larger clay supply ducts laid beneath the floor. After passing through perforations in special sections of supply duct and into floor block sections formed with access to the channels through the lower face (see Fig. 1), warm air flows through the channels in the floor blocks and enters return ducts which carry it back to the heating system for reheating and re-circulation. This is illustrated in Fig. 3.

RadianTile floor blocks are five inches deep by $11\frac{3}{8}$ inches square in face dimensions. The exposed face has a natural smooth die finish. Mortar joints are about $\frac{5}{8}$ inches wide. Channel cells for conducting air are about $3\frac{3}{8}$ inches high by 2 15/16 inches wide with a $\frac{3}{8}$-inch radius at corners. Top and bottom shells are $\frac{3}{4}$ inch thick. Compressive strength is 700 psi, based on gross area of the block with load applied uniformly in the same direction as in service.

Supply and return ducts are made in two-foot lengths with three standard cross-sectional areas; 12 by 12; 12 by 16; and 16 by 16 inches. They are vitrified and glazed. Perforated supply and return ducts have eight three-inch round holes on the top side of each section.

Metal connector sleeves are provided for insertion in floor block channels between blocks. They are intended to prevent mortar between the ends of the blocks from entering the channels.

The following procedure applies to a conventional residence of medium size. If it is desired to install RadianTile underfloor heating to rooms or buildings for other than residence occupancy, the manufacturer

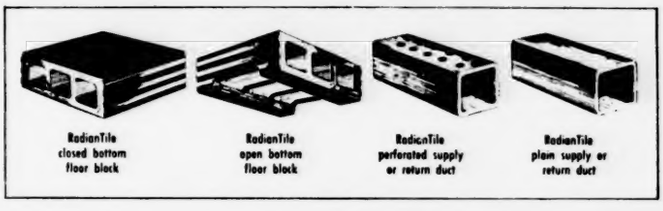

RadianTile closed bottom floor block
RadianTile open bottom floor block
RadianTile perforated supply or return duct
RadianTile plain supply or return duct

Fig. 1. Block and duct forms.

will furnish specific data and should inspect designs of the contractor.

Keeping in mind that:

(1) For comfort, the maximum permissible floor temperature is 90F;

(2) At a surface temperature of 90F a RadianTile panel heating system has a maximum heat delivery to the room of 48 Btu per (hr) (sq ft);

following is a step-by-step design procedure.

Step 1: Compute the heat losses for each room in the house in accordance with standard methods. Allow for air leakage, orientation, etc., but omit heat loss through the floor to the ground.

Step 2: Divide the computed heat loss (in Btu per hour) for each room by the floor area (in square feet). This gives you the heat input that must be provided per square foot of floor per hour.

Step 3: If no room has a heat loss in excess of 48 Btu per square foot of floor area, then the sum of the heat losses for all the rooms in the house will be the basis for selecting the air heater, fan and ducts.

Step 4: If the heat to be obtained from the available RadianTile area at the designed temperature is less than the heat loss from any room, then it follows that the heat loss from that room must be reduced by improving the construction, as by additional insulation, storm sash, weatherstrip, etc.

Step 5: Then the sum of the revised heat losses for the rooms which have been improved in heat-flow resistance plus the heat losses of the remaining rooms shall be the basis for the overall design.

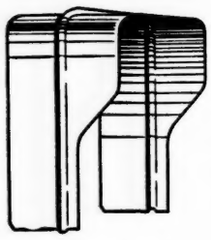


Fig. 2. Sleeve.

Step 6: For efficient heating and proper balancing of the system, the floor area shall be divided into panels of not more than 400 sq ft each. Each panel shall recieve its warm air from a separate supply duct. Self-indicating dampers should be placed conveniently in supply ducts to control the amount of heat required for each individual panel. A return duct shall be placed at the opposite side of the panel to collect the air and carry it back to the heater. A common return duct may be used for several panels. In this case, care must be taken to see that the cross-section area of the return duct is always equal to or greater than the total of the cross-section areas of the supply ducts which carry air to the panels being served by the return duct. The distance between each supply and return duct shall be never more than 20 ft.

Step 7: A continuous strip of waterproof insulation at least one inch thick shall be inserted between any outside wall or outside wall footing, and supply and return ducts and blocks.

Step 8: No air distributing circuit shall exceed 120 ft. This is the distance from the air heater to the panel, through the panel and back to the heater. No circuit shall have more than eight elbows. Where a right-angle turn is required, preference shall be given to use of two 45° elbows rather than one 90° elbow.

Step 9: The maximum air velocity through feeder and return ducts shall not exceed 600 feet per minute.

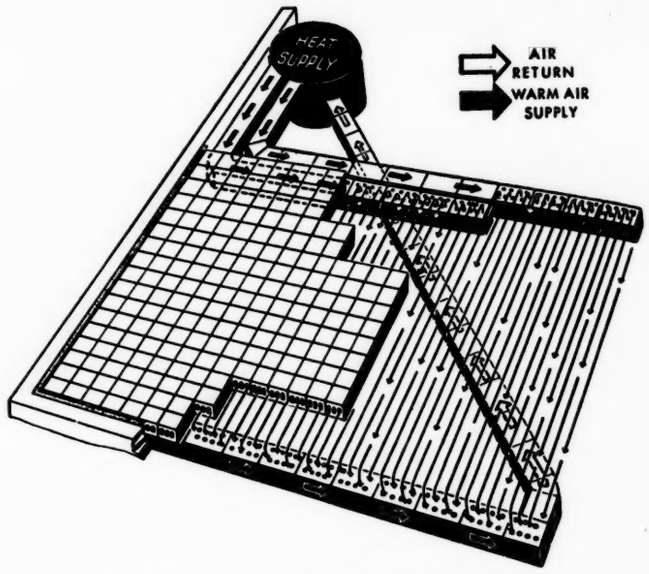


Fig. 3. Schematic diagram of system.

Step 10: The air velocity through the air ways of the RadianTile panels shall be approximately 180 fpm.

Step 11: A 12-inch by 12-inch supply duct is sufficient to serve an area of 400 sq ft. The values given in the following table shall not be exceeded.

Warm air delivery (Btu per hour)	Actual RadianTile duct size (in inches)	Nominal RadianTile duct size (in inches)
Up to 27,000	11½ x 11½	12 x 12
27,000 to 38,000	11½ x 15½	12 x 16
38,000 to 47,000	15½ x 15½	16 x 16

Step 12: The air heater rating to the outlet or bonnet in Btu per hour shall be not less than the value computed in Step 5 multiplied by 1.5.

Step 13: The cubic feet of air delivered per minute by the supply fan shall be not less than the rated heater capacity as calculated in Step 12 multiplied by 0.02, delivered at a minimum static pressure at the fan outlet of 0.25 inches in addition to resistance of the heater.

Step 14: After the installation has been completed, the thermostat controlling the bonnet temperature of the heater shall be set at 120F and the plant shall be put into operation. A thermometer shall be placed in each room in the house on an interior wall about 4 ft above the floor. The self-indicating dampers installed in the ducts which supply each panel shall be adjusted to obtain the desired temperature in each room. Following this equalization the bonnet temperature may be reset to any point desired.

Virtually all installations of RadianTile to date have been in private homes. However, it is pointed out by architect George Fred Keck, who played a prominent role in its development, that there is no reason why it should not be used in commercial and manufacturing buildings. He points out that any competent engineer can design a system for larger buildings provided physical specifications of the product meet floor design requirements and heat losses of the building can be held to within 48 Btu per (hr) (sq ft) of floor area.

Recent Higher Court Decisions

of Interest to Heating and Air Conditioning Contractors

Review of higher court decisions involving companies engaged in heating and air conditioning work. Essential parts of the law are pointed out in the cases reviewed.

LEO T. PARKER
Attorney-at-Law, Cincinnati, Ohio

RECENTLY a reader wrote: "We have a lawsuit on our hands. Please help us to win it. We took a subcontract from a general contractor to install heating in 32 dwellings to be built by the general contractor. The contract contained a clause that we must start installation July 1 on which date the general contractor would be ready for us. The general contractor did not notify us to start work until August 15th. Due to his delay we lost three good employes who refused to wait and we lost a contractor for our material. We defaulted on our contract and did not start the installation work August 15. The contractor is suing us for damages since he had to pay another heating contractor much more to install the heating in the 32 houses than our contract price. Can we win this suit?"

The answer is yes. This is so although you defaulted and breached your contract. However, your default was directly the result of the general contractor's breach of his agreement to let you commence work July 1. Hence, he is liable in damages to you.

For example, in Nix v. Heald Company, 203 Pac. (2d) 847, the testimony showed that a general contractor and a subcontractor executed a written contract whereby the latter agreed to do all the necessary plumbing and heating in 100 homes to be constructed by the general contractor. The general contractor was obliged by a clause in the contract to notify the subcontractor to commence work August 1. The general contractor did not give the subcontractor notice until September 5. The latter immediately began the installation but defaulted on account of the delay from August 1 to September 5 in receiving notice from the general contractor. This delay resulted in the subcontractor losing a contract to buy necessary materials and supplies.

In subsequent litigation the higher court held the general contractor liable in damages to the subcontractor in an amount equal to the profits the latter would have earned had the general contractor notified him to commence work August 1.

This court said that the subcontractor's default was caused by the general contractor's breach to give notice August 1. Hence, the general contractor was directly liable for the financial loss of the subcontractor.

Approval Date

According to a recent higher court a contract begins to run the date it is finally approved and accepted, not the date it was signed.

For example, in the leading case of McCrea v. Automatic Heat, Inc., 55 Atl. (2d) 564, the testimony showed that a property owner signed an agreement to purchase and to have installed certain heating equipment. The property owner paid $153 down, and the installation of the heating equipment was to begin in 30 to 60 days. This contract was signed July 2 in the presence of a salesman of the heating company. Officials of the latter company sent a letter to the property owner approving the contract on August 2. The heating company had not started installation and, on September 23, the property owner wrote and cancelled the agreement. The heating company refused to cancel the contract and offered to start installation.

The property owner filed suit against the heating company to recover the down payment of $153, plus damages. The property owner contended that the heating company breached its contract by failing to start installation within 60 days after the contract was signed July 2. The higher court held the heating company not liable because the property owner had not approved the contract until August 2, and that it was within its legal rights to start installation within 60 days from August 2. The court said:

"The case turns on the effective date of the contract. If it was July 2, the 60 days in which installation was to have been commenced would have expired not later than August 31. However, the effective date was the date when the contract was approved by defendant (heating company) to wit, August 2."

Impossible to Deliver

Modern higher courts consistently hold that a seller cannot avoid paying a purchaser damages for failure to deliver heaters sold under a valid contract, although the seller's reason for not making delivery was that it could not obtain necessary materials to complete the contract.

For example, in Appliances Co. v. Queen Stove Works, Inc., 36 N. W. (2d) 121, it was shown that the Queen Stove Works, Inc. contracted to deliver to the Appliances Co. a specified number of oil heaters at a stated price.

In subsequent litigation, the higher court held that the seller's inability to procure sufficient steel to manufacture enough heaters to fill all its orders on time did not excuse its failure to perform and complete the contract with the Appliances Co. within a reasonable period of time.

Also, this court held that Appliances Co. was entitled to damages, for breach of the contract, equal to

its loss of profits. This court explained that if the purchaser could have obtained the oil heaters from another manufacturer, then the proper measure of damages for breach of the contract was the difference between the contract price and the price at which the heaters were obtained from another maker or seller.

Special Liability

According to a recent higher court, a heating contractor who contributes to an injury to person or property is individually liable for resultant damages.

For example, in May v. Hrinko, 59 Atl. (2d) 823, it was shown that a pedestrian was injured when he fell into a hole or ditch, which was open and unlighted in a public street. This hole was in front of a building in which a contractor was doing installation work. During the work it became necessary to make connections with the municipal water system, which connections involved opening the street and making an excavation from the building to the center of the street. To expedite the work, it was agreed that the property owner make the excavation and be paid by the contractor. The higher court held that whether the contractor is liable depends upon whether the injury was caused by negligence of the property owner. The court said:

". . . If the work done by Hrinko (property owner) amounted to a nuisance then the contractor, having authorized this excavation as necessary to the completion of the contract, is liable, regardless of whether Hrinko was a servant or an independent contractor."

Consideration

It is well established law that a contract without "consideration" is void. Hence, an obligation assumed by one party after a building or installation contract is signed is void. This is so because no agreement is binding where only one contracting party becomes obligated.

For illustration, in Power Service Corp. v. Joslin Plumbing Co., 175 Fed. (2d) 698, the testimony showed The Power Service Corp. is a heating contractor. The Joslin Plumbing Co. is a seller of plumbing and heating supplies and materials. The Power Service Corp. submitted a bid and contract to erect and install three boilers in a plant. The Joslin Plumbing Co. was to furnish all materials and equipment required. After the bid was accepted the parties attached a rider to the formal contract purporting to impose liability upon the Joslin Plumbing Co. for damages resulting from delay in furnishing materials on time. In subsequent litigation, the higher court held the rider void, and said:

"It is our view that the terms of the contract became fixed and the parties bound when the bid was accepted and notice to proceed issued, and that any attempt to alter that specification by the addition of the rider was ineffective for want of any consideration."

Patent Monopoly

Modern higher courts consistently hold that a patentee has an absolute monopoly without violating the anti-trust laws. In other words, he can refuse to sell his patented merchandise, or he can sell it at any price he chooses, irrespective of unreasonable profits, or he can sue and recover damages from anyone who without a license either makes, sells or uses the patented device, or he can set the prices at which purchaser must resell his devices.

On the other hand, a patentee cannot extend his monopoly by licensing patents owned by other patentees.

See United States v. Line Co., 68 S. Ct. 550. Here it was shown that a manufacturer of electrical devices used in combination with heating systems incorporated a price maintenance provision in its licenses and sale contracts.

The Supreme Court of the United States held that this arrangement violated the Sherman Act, since the company not only fixed the price of products embodying its own patent, but also fixed prices of devices manufactured under licenses from other patentees.

For comparison, see the leading case of General Electric Co., 272 U. S. 490. Here the testimony showed that a patentee set prices at which a licensed manufacturer must sell the products.

The Supreme Court held that this agreement does not violate the anti-trust laws.

Violates License Law

The purpose of laws requiring heating contractors, plumbers and others to obtain licenses is to regulate the construction, installation, and alteration of buildings in urban and thickly populated areas, so that only competent persons may perform such work. Such laws are valid and far reaching.

For example, in McDonald v. State, 28 So. (2d) 805, it was shown that a subcontractor who had no license, constructed and connected a waste pipe.

In subsequent litigation the subcontractor contended that laying waste pipe is not plumbing work and no plumber's license was required.

Nevertheless the higher court convicted him of violating the state license law, and said:

"The word 'plumbing' shall be held to mean and include all piping, fixtures, appliances and appurtenances in connection with the drainage, ventilation of the same or water supply system within a building, residence or structure."

Not Double Taxation

According to a recent higher court, a corporation in a state may be taxed on stock it owns in a foreign corporation which also pays taxes to the state.

For illustration, in Commonwealth v. Shenango Furnace Co., 67 Atl. (2d) 113, it was shown that the Shenango Furnace Co. owned shares of stock of a foreign corporation which, doing business in Pennsylvania and employing property there, was subject to the Pennsylvania corporate franchise tax. The furnace company's officer contends that, to include in the value of its capital stock, its investment in the shares of this foreign corporation, works double taxation. The higher court refused to agree and said that in deter-

mining the value of capital stock of a domestic corporation, for capital stock tax purposes, the domestic corporation could not expect a deduction based on its investment in shares of stock of a foreign corporation doing business and having property in the state and paying a franchise tax to the state. In other words, this is not "double" taxation.

Manager Not Liable

Modern higher courts consistently hold that either a manager, official, or employe is personally liable to anyone whom he damages by false statements, void guarantees or misrepresentation. However, according to a recent higher court a manager is not liable if the court vindicates the employer.

For example, in Melchion v. Burkart, 87 N. E. (2d) 373, a property owner sued the Queen City Furnace and Heating Co. for breach of a contract to install a good and satisfactory heating system in his home. The lower court listened to the testimony and decided that the heating system was reasonably worth the contract price and refused to award damages to the property owner. The latter then sued the manager of the furnace company and claimed that the manager made misrepresentations about the furnace and that the furnace installed under the contract failed to conform to the manager's representations. The higher court refused to hold the manager personally liable, and in part it said:

"The judgment for the principal is a bar to this action against the agent."

This court also explained that the furnace company and its manager would have been jointly liable in damages, if the property owner had sued both the company and its manager in the first suit and proved that the manager misrepresented the quality of the furnace.

Available for Work

According to a recent higher court, an employe may receive compensation under the State Unemployment Compensation Act if he is unable to work at his regular trade and willing to accept lighter work.

For illustration, in Hinkle v. Lennox Furnace Co., 83 N. E. (2d) 521, it was shown that Hinkle was employed by The Lennox Furnace Co. as a sweeper. His duties consisted of scattering steel shavings on the oily floor and after the shavings had soaked up the oil to load them on a wheelbarrow and wheel them away. This work was too heavy for him, and his doctor advised him to get lighter work. Shortly thereafter he filed a claim with the Bureau of Unemployment Compensation. His claim was disallowed and the employe appealed to the higher court. He proved that he had offered to perform such work as that of a watchman and also of checking materials. In view of this testimony the higher court awarded compensation to the employe, saying:

"The record in this case discloses substantial evidence that although the claimant (employe) was not able to perform the same work as theretofore which was in this usual trade or occupation, he was available for work in other occupations for which he had previously demonstrated his fitness."

For comparison, see Wall v. Industrial, 41 So. (2d) 611. Here an employe was laid off his regular work, and was offered somewhat similar work. The employe refused to take the offered job claiming it was harder work. Since he was physically able to perform the new work, the higher court refused to award compensation under the State Unemployment Compensation Act.

Explosion Suit

In the past, a heating contractor asked this question: Can a heating contractor avoid damages to a gas consumer for an explosion of gas in appliances sold and installed by the contractor? The answer is: The heating contractor is liable if the testimony shows that the explosion resulted from negligence of the contractor's employes.

According to a recent higher court, failure of a contractor's employe to properly repair an appliance is negligence for which the contractor is liable.

For illustration, in Atlanta Co. v. Johnson, 46 S. E. (2d) 191, it was disclosed that a contractor installed a stove and hot water heater in a private home. Later the hot water heater developed trouble and the pilot light would not stay lit. The contractor sent a repairman to the home. A few days afterward, the home owner found the pilot light not working and struck a match for the purpose of lighting the pilot. The gas which had escaped through the unlighted pilot exploded in a violent manner, severely injuring the home owner who sued the contractor for damages.

The higher court held the contractor liable because his employe failed to properly repair the defective hot water heater.

Cost-Plus Contract

Considerable discussion has arisen from time to time over the legal question: Is a property owner liable for payment for materials purchased by a heating contractor who does work on cost-plus contract? The answer is: Only when the contractor has been appointed legal agent of the property owner.

For example, in Carruth v. Valley Co., 221 S. W. (2d) 584, the testimony showed that a contractor took a cost-plus contract. He purchased materials for the work, and when the bill was not paid, the seller sued the contractor and also asked the court to grant a mechanic's lien against the real property.

The higher court refused to award the seller a mechanic's lien and held the contractor personally liable saying:

"The established rule is that a cost-plus contract does not, of itself, make an independent contractor the agent of the owner of a building for the purchase of materials for its erection or repair."

Also, see J. B. McCrary Engineering Co. v. White Co., 4 Cir., 35 F. (2d) 142. This court held that a cost-plus contract does not make a contractor the legal agent of the property owner, unless the latter so authorizes.

Experience is my Classroom

By T. W. REYNOLDS

• HOW NOT TO SELL

Who likes the new salesman who comes around and does not at first indicate that he is selling anything, but instead sends in the name of some mutual friend. Thereby, he secures an entry and an immediate one, perhaps when you are most busy. Too late, you recognize that he got in by a ruse, so you dislike him for having outsmarted you and extend the dislike unfairly to the product he represents.

How can you trust such a fellow in the future on anything? Under the circumstances, your mind is taken up with his too clever tactics to the exclusion of listening to what he has to say. What has he gained, except his immediate objective of telling his story, to which unfortunately he alone listens.

Such a salesman is usually the one who, granted the ten minutes he requests while you listen quietly the meanwhile, assumes himself a most interesting fellow and takes another ten minutes. Then when you grow restless until even he notices it, will still continue to talk until his story is too long for you to concentrate on or later on recall the real points. Once the customer grows restless, his emotions take over his reasoning, and he has stopped listening. What then does the salesman gain, except to check and double check his own story?

• REMEDIES FOR POOR DRAFT

Probably no part of the sick heating plant has so many available cures as has the chimney. Besides the obvious one of building a new chimney, extending the chimney upward, installing an undergrate blower or induced draft fan at chimney base, or new boiler of less resistance, there are many other things that can be done. For example, (1) increasing flue area by freeing boiler, chimney and breeching of soot, (2) using a fuel that produces less soot and resistance, and (3) providing a fuel bed that is less resistant. Shaking the ash from the grates more frequently and firing more often allows a thinner fuel bed to be carried, one through which the air can pass more readily. Sometimes, in large plants, they even change the fireman to get results.

On rare occasions a grate of larger area which allows a thinner fuel bed to be carried will be the answer, providing the fireman can maintain a good combustion over the entire area of the grate. On the other hand, an indifferent draft may cause thin spots in an already thin fuel bed through which excess air will readily flow to by-pass the fuel, cool the boiler, and crowd the flueways. As a rule, the reverse procedure of reducing grate size works out better, thus concentrating the available draft over a smaller area.

A chimney on an exterior wall may be more easily inspected and repaired for leakage than an inside chimney. The clean-out door at the chimney base should also be made tight. Unnecessary elbows should be removed from the breeching, leakage stopped, and the breeching well covered throughout. Sometimes it is only the tightness of the house that needs correction; the boiler may have no air supply. In such a case not even a ventilator on top of the chimney will help, except to stop downdrafts.

Possibly one may find ways of reducing the pick-up load when draft requirements are the greatest. For example, the pick-up period can be reduced by extending its time, starting earlier, stopping any exhaust ventilation the meanwhile or even permanently. Thorough insulation of boiler and all its piping will also lighten the pick-up load, as will also the separate heating of the domestic hot water supply.

Maintaining a hot chimney by attaching to it a separately-fired hot water heater will also reduce the pick-up time, especially with a chimney on an exterior wall which on-off boiler periods fill up with cold air and which cools off due to its low mass. All chimneys have an inch or more of cold film clinging to their inside perimeter. For this reason, the writer feels that the effective area of a chimney must be less when the chimney is on an outside wall.

Making the draft sufficient by reducing the heating load is another way out of difficulties. For example, the closing off of unused rooms and a good use of insulation, weatherstripping and storm windows, will all require less fuel and therefore less draft.

There is nothing much that can be done about chimneys with such a large area that they invite downdrafts and recirculate air within themselves. Recirculation causes a temperature drop, eddies, and friction losses which increase as the square of the rate of flow. A chimney with the length of one side double that of the other side spirals gases up one side while drafts come down the other side. An unlined chimney may have more air leakage, and have appreciably high friction losses in low residences.

FUEL OIL PRE-HEATING

As of April 1949, the Board of Standards and Appeals in New York City made certain rulings relative

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Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

to pre-heating of fuel oil to prevent passage of oil back to the boiler. Since that time, their interpretation of what is an approved oil heater, seems, in effect, to limit one to the use of a heater which has either a double shell or double coil, so that oil leakage becomes impossible.

I say, "in effect," because while true that one can still use an approved single shell heater as before, he can do so only if it is installed as a steam heater at not over 10 lb pressure, the condensate wasted to drain, and the piping arrangement made as shown in the accompanying sketch. Now steam, as a rule, is satisfactory for oil pre-heating only where there is no burner shut-down period, or where steam pressure is constantly maintained day and night. Furthermore, the arrangement introduces complications and expense for temperature regulation with strainer protection, pressure gage, steam trap, and valves and piping complete with by-passes. Maintenance is also increased. Then, too, who likes to waste condensate?

It is, of course, possible, if not probable, that a heater tube could fail and permit in-leakage of oil to be carried back to the boiler. To prevent this remote contingency, condensate with possible oil must be wasted to sewer. This leads on to further precautions. Suppose the steam trap fails to function, so that the shell of the heater becomes flooded with backed up condensate and oil. In this event, as steam pressure is lowered, condensate might flow back to the boiler. So a check valve is required to prevent back flow. Now if we put a by-pass around the supposedly inoperative steam trap we can eliminate the flood, if and when it occurs. All this is fine, but since oil cannot ignite without atomization, one wonders what it is all about.

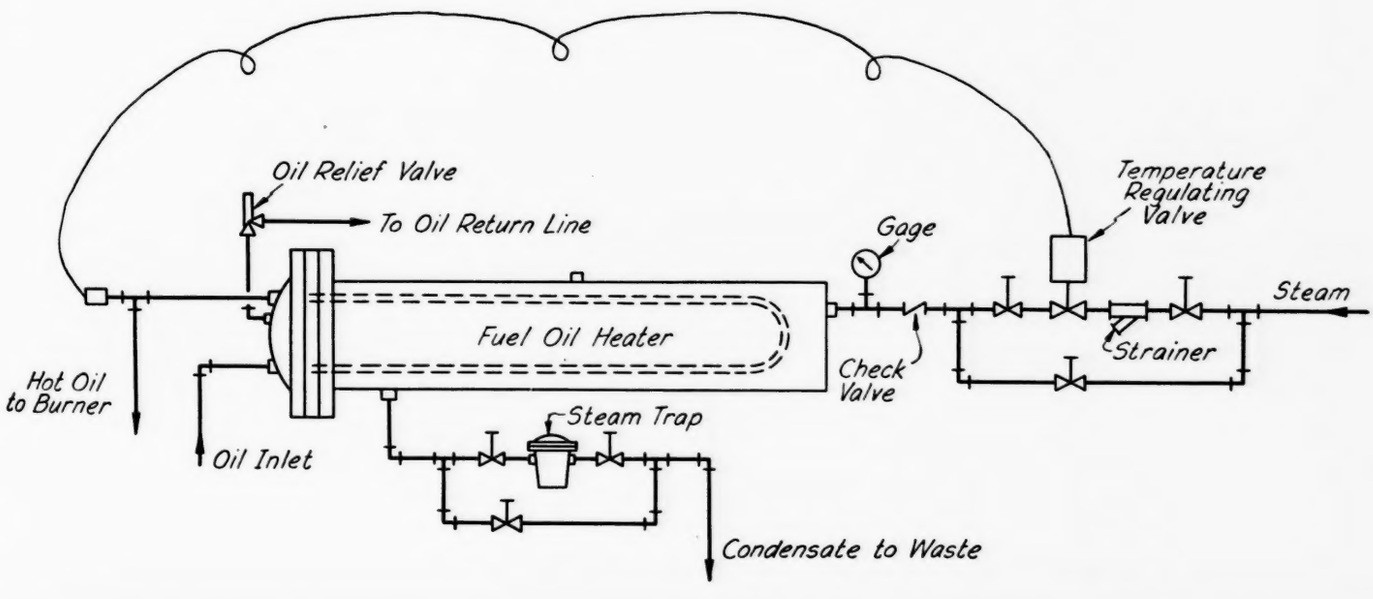
Oil heating devices with double shells or coils cannot be designed overnight, especially so when duplication makes efficient heat transfer and proper temperature hard to achieve. At its best, the pre-heating of oil has not always been satisfactory to the operator. It's a funny thing, but a burner with intermittent operation may give the heater time enough for transfer of adequate heat, yet a burner which starts and then runs steadily may soon draw upon that portion of the oil which has had no time as yet to be heated. There are problems with oil heating without making it harder.

For years, thousands of the normal single shell oil heater have been operating all over the United States without back flow of oil to the boiler. Nevertheless, pending the possible advent of a heater which can be designed in the single shell type for non-leakage and still be approved, or else a design in the double type which will nevertheless still give proper heat transfer, we find ourselves with many buildings in New York where a certificate of occupancy cannot be obtained due to innocent violation of the new rulings.

Many installations were started or contracted for on prior dates, and others are coming along. For the time being, to obtain occupancy, the heating arrangement must either be locked with seal by the authority having jurisdiction to insure non-operation, or the installation must be changed over for steam heaters as previously outlined.

There have been some 70,000 installations of the single shell heater and I have heard rumors that in two cases in a period of 20 years oil was returned to the boilers, one of which somehow blew up. The reader can use his own judgment as to the risk involved, but my own opinion is that the risk is the same as my chance of being hit by a meteorite at precisely noon on Jan. 1st in Beacon St., Boston, while eating a raw cod.

The fire department has also been very much concerned about such matters, yet willing to go along if the dealers will guarantee oil with a safer flash point. The dealer, however, is positioned somewhat as the cow which as it forages produces milk of various grades. Incidentally, to know whether a new heater is approved one must look for the label which must be of the proper type and permanently secured to the heater.



Approved method of piping steam fuel oil heaters to prevent backflow to boiler of possible oil leakage.

NEWS OF THE MONTH

NEW REFRIGERANT

may simplify equipment and boost reciprocating compressor capacities.

Development of a new refrigerant was reported to members of the American Institute of Chemical Engineers at their Houston meeting in March by two Syracuse scientists working on the research project for Carrier Corp.

ECONOMICAL.—The new refrigerant, known as Carrene-7, is expected to find widespread use in air conditioning and refrigeration industries. Using the new refrigerant, it will be possible to do the same variety of refrigeration jobs with fewer types of machines.

Carrene-7 possesses all of the desirable properties required for a safety refrigerant and also permits a reciprocating compressor charged with the new gas to produce a substantially greater refrigerating effect. The immediate result of this characteristic will be to increase the effective capacity of available reciprocating compressors, without requiring that they be redesigned.

• **DEVELOPMENT.**—Carrene-7 was developed after six years of investigation carried out under the direction of Dr. William A. Pennington, chief chemist and metallurgist of Carrier Corp., who was assisted in the work by Winston H. Reed, holder of a Carrier fellowship at Syracuse University.

The new refrigerant is a carefully proportioned mixture of two fluorinated hydrocarbons. It is an azeotropic mixture, so-called because it always boils at the same constant temperature corresponding to a particular pressure. Chemically it is composed of dichlorodifluoromethane (Freon - 12) and unsymmetrical difluoroethane (Genetron-100).

The discovery of Carrene-7 came as a result of a search for a refrigerant which, when charged into a hermetic system designed for Freon-12 and 60-cycle power supply, would maintain the same capacity when 50-cycle power was used. Carrene-7 has been found to be an ideal solution to the 50-cycle problem since it gives almost exactly the same capacity with 50-cycle current as F-12 does with 60-cycle current, or a capacity about 18% higher than F-12 where the same compressor is employed at the same speed.

The research leading to development of Carrene-7 was described by Pennington and Reed in a paper entitled "The Evolution of a New Refrigerant." Part of the paper was devoted to the development of criteria for judging and predicting the properties of promising refrigerants, thus avoiding the impractical task of investigating all of the 9,000 known single compounds.

• **PROPERTIES.**—With the realization that a single compound was not likely to be found, the scientists directed their study toward finding a mixture which would boil at a constant temperature while the pressure remained the same. An essential requirement was that the atmospheric boiling point be between —27.5 and —30.7F. Carrene-7 has a boiling point which falls within this range.

The authors reported that many factors, in addition to refrigeration capacity, were considered in the development of the new refrigerant. Among these were chemical stability, flammability, toxicity, effect on metallic and non-metallic materials used in refrigerating systems, and certain thermodynamic properties affecting performance. Carrene-7 satisfies all of the important requirements for a useful refrigerant. It is chemically stable, non-flammable, physiologically safe, and does not attack or corrode the common materials of construction. Its cycle efficiency and other thermodynamic properties are very similar to Freon-12.

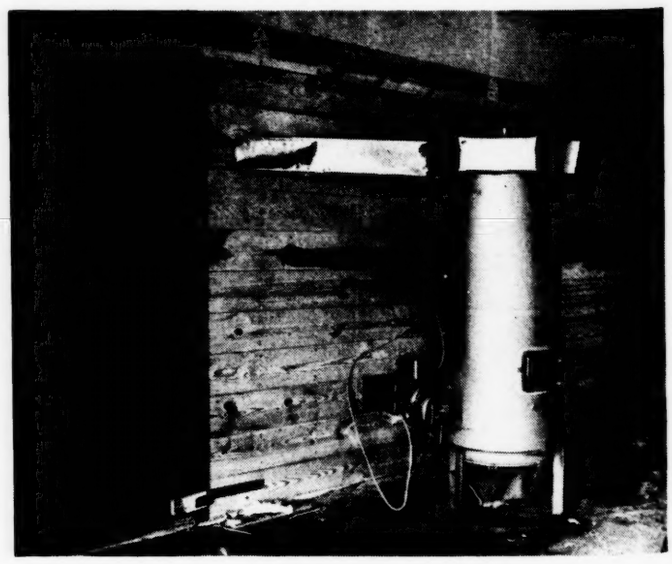
Limited applications have already been made, and plans are being formulated for broad commercial use.

TEMPORARY HEAT

from direct-fired units helps burned-out plant resume production.

Friday the 13th held the traditional hoodoo for the Flock-Process Corp., Merritt Manufacturing Division at Norwalk, Conn. Right at the height of peak-season activity, the plant was reduced to 50% of its normal working area by a disastrous fire. Sound fire walls and alert action by the local Fire Department managed to save about half of the plant's working facilities, but the heating system was crippled—and the time was mid-winter!

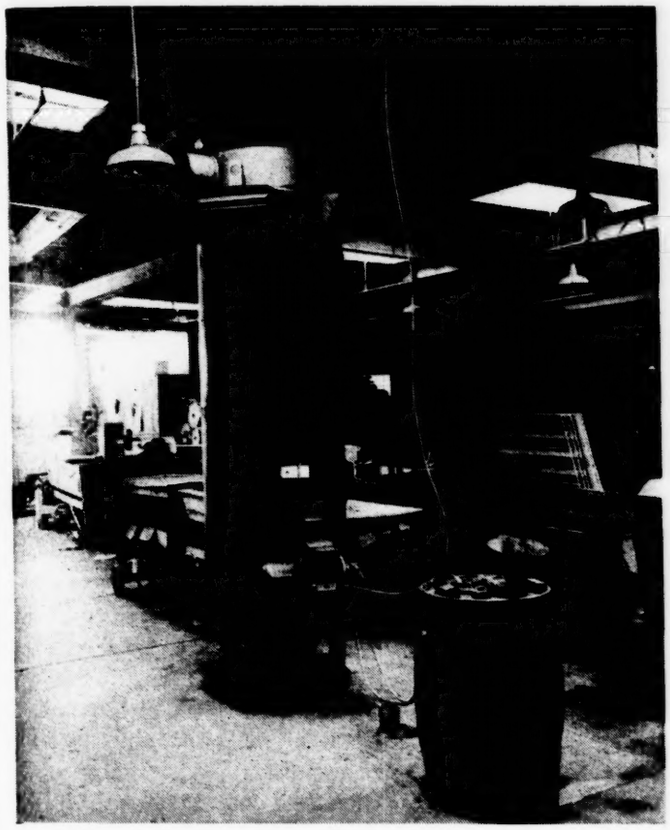
A quick survey by management showed that the potential loss, through failure to fill orders, threatened to overshadow the actual loss caused by the fire. Since Flock-Process is a subcontractor for manufacturers of



Direct-fired unit ducted through wall for safety.

finished products in which flock-coated products are utilized, any serious curtailment of production threatened to affect many other plants, as well as the one that was stricken. It was of prime importance that work be resumed at once.

• **SAVED.**—Part of the production area, enclosed by fire walls, was untouched by the fire. The problem was to re-organize operations within that area. Connecticut Light & Power put in temporary service to



Temporary heater in unburned production area.

restore power to the equipment. Most of the machinery needed for producion was undamaged. The only hurdle that remained was to find means of heating the partially demolished structure, so that employees could be called back, and work resumed.

To answer that one, management consulted the Thermobloc Division of Prat-Daniel Corp., located 20 miles away in East Port Chester, Conn., to determine whether self-contained, direct-fired heating units could be obtained promptly and used as temporary heat.

• **HEAT.**—As emergency calls for this equipment are not unusual, Prat-Daniel had available one unit of each of the two standard sizes of Thermobloc; a 300,000 Btu per hr unit and a 550,000 Btu per hr size. These were trucked over on Monday morning and by noon, the two units were providing ample heat for the undamaged working area of the factory.

The units were connected to 50 gal drums of oil and were wired into the 110-volt lighting circuit in the building. The large model was placed in the large room which housed the fabric coating machines, and in which temporary offices were set up.

In view of the fact that adhesive spraying with volatile flammable solvent was carried on in the sections of the building in which metal parts were coated, it was necessary that the direct-fired unit be installed outside of this room. The smaller of the two units were located in the freight alleyway, and ducts were run to carry the heated air into the metal parts flocking section of the building. The air from this room was not recirculated to the unit, so that no solvent vapors were introduced to the heater.

As a result, all services were resumed and operations restored in the undestroyed sections of the building on almost a full scale basis within four days of the fire.

PITTSBURGH SWITCHING

from coal to other fuels. Many installing gas equipment.

Here's another indication that Pittsburgh is burning far less coal than in the past—

Statistics on the work done by the Pittsburgh Bureau of Smoke Prevention last year show that installations of coal-burning equipment were far below the year before, while installations of gas-burning equipment were 'way up.

In 1948, the Bureau issued permits for 298 commercial stokers to be installed in Pittsburgh. In 1949 only 107 were installed.

• **CONVERSIONS.**—In 1948 there were 631 permits for domestic stokers. In 1949 there was only 213.

All told, just about a third as many stokers were installed last year as the year before.

Commercial gas conversions dropped a little between the two years, from 248 to 199. But domestic gas conversions rose from 592 to 831. And new gas boilers were 160 in 1948 and 212 in 1949.

All told, there were 1242 gas installations last year as compared with 1001 the year before.

Such changes have been attributed to the coal strikes and uncertainty of coal supplies.

Other statistics on the Bureau of Smoke Prevention's work indicate that Pittsburgh is becoming accustomed to smoke control.

• **COMPLAINTS.**—Complaints to the Bureau are down. Also down are the number of furnaces sealed for repeated violations, the number of persons brought before magistrates for having no permits and the number of coal truckers summoned to the office or taken before magistrates.

The number of persons summoned to the office for smoke or equipment violations increased from 51 to 67 between the two years, however. And informations filed before magistrates for smoke violations increased from 15 to 16.

The smoke inspectors made 4,272 annual inspections of larger fuel-burning installations, as compared with 3,180 the year before. They discovered that 562 needed repairs, while the year before the figure was only 363.

MAGNESIA CONDUCTIVITY

brought up to date by recent NBS tests.

Calling attention to a recent test by the National Bureau of Standards, Marshall F. Allen, manager of The Magnesia Insulation Manufacturers Association, points out that figures heretofore in common use for the *k* factor and density of 85% Magnesia insulation are based on tests conducted by the Bureau in 1919.

Recent test made on 85% Magnesia block of current manufacture, weighing 13.2 lbs per cu ft, indicated a *k* factor, or thermal conductivity value, of 0.39 (Btu) (in.) per (hr) (sq ft) (F) at 130 F mean temperature. According to Mr. Allen, these values are in close agreement with averages of the results obtained in numerous conductivity tests by the manufacturers on the current product. These averages were given as follows:

Mean Temp., F	*k*
100	0.39
300	0.45
500	0.51

"These values represent no sudden change, of course," Mr. Allen stated. "They are simply up-to-date figures, representing steady improvement since the last Bureau of Standards tests were made some thirty years ago."

RESEARCH RESIDENCE

undergoes temperature distribution tests with warm air in slab floor ducts.

A preliminary report on tests in progress at research Residence No. 3, University of Illinois, was presented by M. E. Childs at the 36th annual convention of the National Warm Air Heating and Air Conditioning Association in Cleveland.

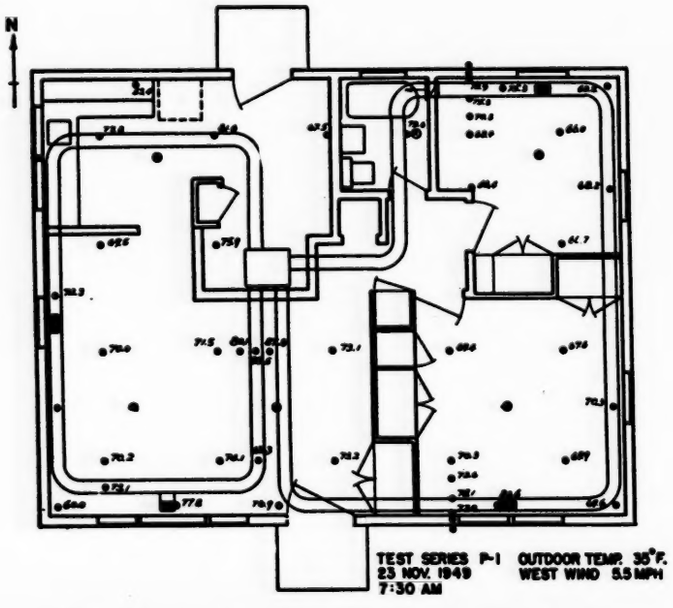


Fig. 1. Layout of system and floor temperatures.

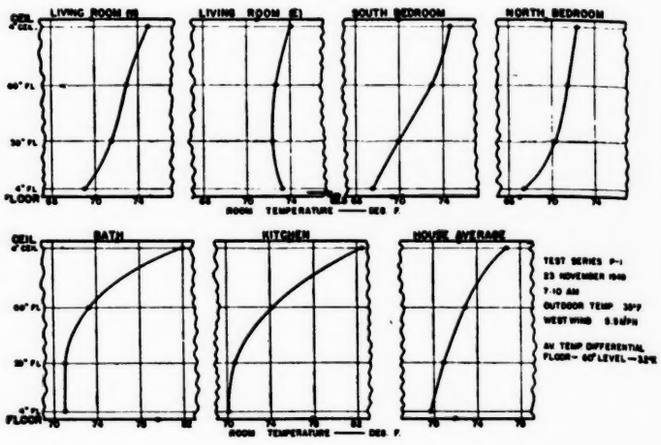


Fig. 2. Temperature gradients

• **SLAB.**—The residence is typical of low-cost, slab-on-ground homes being built in large numbers today. The house measures 32 feet by 24 feet and has a calculated heat loss of 50,000 Btu per hour at 80F temperature difference. A warm air furnace is located centrally and supplies a two-loop perimeter system of 8-inch round 24-gage galvanized duct placed two inches below the top of the slab. Layout of the system can be seen in Fig. 1. Warm air is delivered to rooms through floor registers under windows, shown in black in Fig. 1. Return air passes through a grille located in the ceiling of the hallway.

• **TEMPERATURES.**—Fig. 2 shows temperature gradients typical of those experienced in Residence No. 3 for 30 to 40F outdoor temperatures. Gradients are measured in six stations throughout the house and at 4-inch, 30-inch, and 60-inch levels, and 4 inches from the ceiling. Floor to ceiling differentials in the bathroom and kitchen-utility room were 11.0 and 11.8F, respectively. These large differentials are explained by the use of a high wall register in the case of the bath and by heat gain from the furnace casing and ducts in the case of the kitchen-utility room.

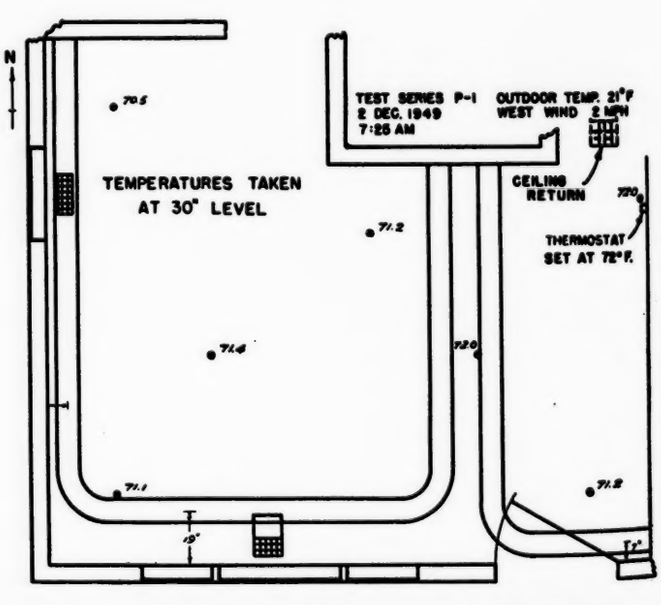


Fig. 3. Temperatures at 30-inch level in living room.

In general, the temperature gradients experienced in Residence No. 3 for 30 to 40F outdoor temperatures have been good, especially in view of the fact that no storm windows or weatherstripping have been used. Fig. 3 shows horizontal temperature distribution in the living room at the 30-inch level for an outdoor temperature of 21F. The greatest difference observed was 1½ degrees between the northwest corner of the room and thermostat.

Typical floor surface temperatures for 30 to 40F outdoor temperatures are shown in Fig. 1 with small dots indicating thermocouple locations. The lowest temperature observed in the area enclosed by the perimeter duct was 66F in the north bedroom. Temperatures above the ducts range from 87.8F to 68.2F. These temperatures were observed when the outdoor temperature was 35F and the bonnet temperature 125F.

Mr. Childs' conclusion was that performance of the perimeter system in Residence No. 3 in 30 to 40F weather has been satisfactory from a standpoint of temperature differentials in the living zone, temperature balance within given rooms, and from the standpoint of floor surface temperatures.

CONDUCTIVE GLASS

may be used as heating unit for wall panels, windshields or coffee percolators.

A new glass is a transparent stove that heats air or boils water for coffee. All you do is push a switch to feed electric current into the glass.

The glass has a transparent skin that conducts electricity, but resists enough to heat the glass up to 660F. The skin is a metallic oxide only about 16 millionths of an inch thick.

This bit of glass magic is the latest development of Corning Glass Works. It is called E-C glass, meaning electrically conducting.

• **USES.**—Heaters made of flat panels of this glass are being used to keep baby chicks warm in brooders, to dry textile yarns and dry the lacquer on plastic playing cards. These are the first field tests of the new glass, Corning said.

A coffee percolator of electric glass is being developed. Within fifty seconds it starts water perking to make coffee. The coffee maker sets on a plastic base. Two electrodes carry the current to the electric skin coating the bottom of the coffee maker.

One might also have wall panels of electric glass to heat a bathroom. The glass is being used for ice-free windshields on the bridge of a ship in Arctic service. It could be used for auto windshields, if auto batteries were changed to supply alternating current.

The glass can produce a wide range of temperatures, depending upon the resistance of the film and the power of current used, said Rushmore H. Mariner, director of new products at Corning.

In heaters the electric glass saves space and gives uniform heat, he said. In the coffee percolator the skin reflects heat inward to the water for high efficiency.

The glass used is of the strong, tough, heat-resistant types used for cooking, and it can be fashioned into any shape. The electric skin is applied to the glass at high temperature. The skin is more resistant to scratching or to chemicals than the glass itself, he said.

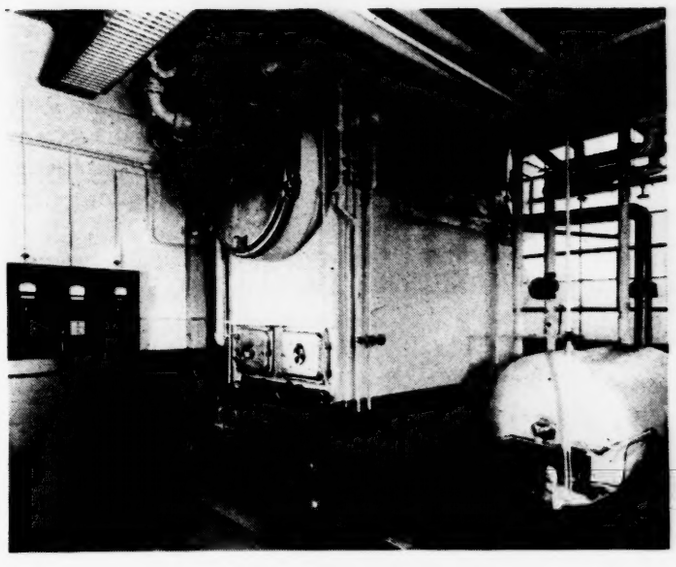
The glass heaters have a guaranteed life of 1,000 hours, but are believed to keep working indefinitely, Mr. Mariner said.

BOILER ROOM

spruced up by paint and polish as center of heavy spending and important function.

In recognition of the fact that the boiler room is one of the more expensive portions of the plant from the standpoint of both original and maintenance costs, McDonnell and Miller, Inc., Chicago, manufacturers of water level controls, have put through a program of redecorating and housekeeping in their own boiler plant.

In addition to painting of walls and heavy equipment in attractive blue and white, piping was painted



McDonnell and Miller's boiler room.

with identifying colors, and cleanliness of the boiler room has been made an important part of maintenance procedure.

Results of the program, says H. C. McDonnell, president of the firm, have not only given the boiler room an eye-appeal commensurate with its importance, but have also assured economical maintenance and operation because of the enthusiastic and prideful attention of boiler room personnel to proper operation of both fuel burning and control mechanisms.

FLUID DYNAMICS CONFERENCE

at University of Illinois to feature dedication of new ME building and include APS meeting.

The department of mechanical engineering of the University of Illinois will dedicate a new mechanical engineering building on May 12 and 13. Concurrently, the department will conduct a mid-western conference on fluid dynamics together with a meeting of the American Physical Society, Fluid Dynamics Division.

• **DEDICATION.**—Formal dedication of the new building will be on Friday, May 12, with Arthur Cutts Willard, president and professor of heating and ventilating, emeritus, as chairman. The program will include addresses by Dean of Engineering Audrey A. Potter and James D. Cunningham, president of ASME. A dedication banquet will follow in the evening.

• **CONFERENCE.**—The mid-western conference on fluid dynamics will begin technical sessions on Friday May 12 and continue through Saturday noon. Sessions will cover the subjects of aerodynamics, external flow; mechanical engineering, internal flow; hypersonic and low-density flow techniques; turbulence and aerophysics; astro-physics, computing machines, mathematical theory of fluid dynamics; meteorology; chemical engineering; hydraulics and other contributed papers.

UPPER ATMOSPHERE

to be analyzed by electro-magnetic instrument in new weather forecasting research.

Air samples captured from the upper atmosphere more than 18 miles high are being analyzed at Cambridge, Mass., by means of an instrument which uses electric and magnetic fields to sort the sub-microscopic particles making up gases and vapors.

The upper-atmosphere investigations are being carried on by the Geophysical Research Directorate of the Air Force Cambridge Research Laboratory.

• **WEATHER.**—The instrument is called an analytical mass spectrometer. It will be used in new studies of the composition of the earth's atmosphere, and may lead to development of new weather-forecasting techniques.

High-sensitivity range of the mass spectrometer will aid in the study of reactions which scientists believe take place among constituents of the atmosphere as a result of absorption of radiant solar energy. It was emphasized that the studies are still in the preliminary stages.

Designed and built in the General Electric Co.'s General Engineering and Consulting Laboratory at Schenectady, N. Y., the mass spectrometer is so sensitive that under some conditions it can detect a gas which makes up only one part to 100,000 parts, of another gas, G-E engineers said.

In operation of the instrument, the gas to be analyzed is introduced into an ionization chamber, where its molecules are given electric charges. The molecules then are accelerated through a magnetic field which changes the direction of their movement. The lighter molecules are deflected to a greater extent than the heavier ones. In this way, molecules of any desired weight can be separated from those of other weights.

Because it separates molecules of different weights, or masses, the instrument is useful in recording presence of isotopes, particles which react chemically in the same way as others, and differ from them only in mass and atomic structure. Scientists of the Air Force laboratories will use the instrument to seek upper-atmosphere isotopes which have not yet been discovered.

G-E engineers said that when the strength of the magnetic field controlling paths of molecules is altered, molecules of the gas under analysis can be spread across the instrument's collector plate in a molecular pattern according to their weights. Weights from 1 to 300 can be separated, they said.

NEWS BRIEFS

• Iroquois Gas Corp., Buffalo, New York, has requested Federal Power Commission authorization to develop three new underground natural gas storage fields, to enlarge an existing field, and to construct approximately 23 miles of pipeline, all in western New York State. The estimated cost is $2,119,500. Purpose of the proposed construction and expansion program is to help the company meet heavy winter peak day demands, and no new markets would be served, Iroquois said. Two of the underground storage pools which the company plans to develop are located in Erie County, one near Wales and Holland, and the other in the Evans area. The third new field is in the vicinity of Bennington in Wyoming County. The existing field, which the company proposes to enlarge, is the Collins Storage Field, at Collins, in Erie County.

• A patent covering a reversible regulating valve for year-around air conditioning systems has recently been awarded to R. U. Berry of the Air Conditioning Department, General Electric Company, Bloomfield, N. J. The patent is the fourth to be awarded to Mr. Berry. The valve system is designed for air conditioning installations which are equipped with full automatic year-around control where the changeover from heating to cooling, and vice versa, will be accomplished by reversing the direction of flow.

• An extensive project is now under way at the Bureau of Standards for revision of all the common thermocouple tables in order to take into account recent changes in electrical units and in the International Temperature Scale. Present plans call for publication during 1950 of eight tables giving the temperature-emf relations for platinum-platinum rhodium, chromel-alumel, and copper-constantan thermocouples.

(More News Briefs on Page 128)

Abstracts AND Reviews

Publications abstracted in this department should be ordered direct from publisher.

HEATING, VENTILATING AND AIR CONDITIONING

Designed primarily as a textbook to be used for a two-semester course covering the principles of heating, ventilating and air conditioning, W. T. Miller and Frederick B. Morse, professors of mechanical engineering, Purdue University, have made available for independent study, the third edition of their Heating, Ventilating and Air Conditioning Notebook.

Care has been taken in the preparation of the text to make the material self-sufficient to avoid handicapping the student who lacks a good background in elementary physics and thermodynamics.

At the end of each chapter are a number of blank cross-section sheets to enable expansion of the book to include technical material of specific value to the user of the text.

The book has been divided into 18 chapters, including the following subjects: Heat transfer; condensation in structures; comfort engineering; heating requirements for buildings; heating systems; radiators, convectors and unit heaters; mechanical hot water heating; hot water panel heating; thermodynamic properties of air and vapor mixtures; air conditioning for comfort; and duct design.

Heating, Ventilating and Air Conditioning Notebook. Heavy paper cover, spiral binding, 8½ x 11 inches, 330 pages. Published by Tri-State Offset Co., 817 Main St., Cincinnati 2, Ohio. Price, $3.75.

FUELOIL & OIL HEAT GUIDE

The 1949-50 edition of Fueloil & Oil Heat Buyer's Guide and Industry Directory contains listings of manufacturers of oil burner and heating equipment accessories and supplies. There is a listing for oil burner manufacturers by types of equipment and another which lists the companies alphabetically. This same plan is followed as regards the listings for accessories, equipment and supplies. The directory also has a section devoted to trade names.

Fueloil & Oil Heat Buyer's Guide and Industry Directory. Paper covered, 8 x 11 inches, 112 pages. Published by Heating Publishers, Inc., 232 Madison Ave., New York 16, N. Y. Price, $2.

WELDING HANDBOOK

Engineers and others interested in welding will find much of value in the third edition of the Welding Handbook which has just been published by the American Welding Society.

Twenty-seven chapters are devoted to the more than 30 welding and cutting processes used in industry today. Information on each process covers the equipment used, the basic principles of operation, and the application of the process for different metals and different industrial applications.

Thirteen chapters contain information on the ferrous and nonferrous metals commonly welded, including their general properties, how to weld them with the different welding processes and their use by different industries. Metals covered include iron, wrought iron, carbon and low-alloy steels, chromium steels, chromium-nickel steels, manganese steels, aluminum, magnesium, copper and nickel and their alloys, lead, zinc, clad steels and applied liners.

The book contains 65 chapters covering the more than 30 welding and cutting processes in use by industry today, the welding of ferrous and nonferrous metals and alloys, and the application of welding in different industries. Also included are individual chapters on cost estimating, welding metallurgy, physics of welding, a dictionary of welding terms, general engineering tables, welding symbols, filler metal specifications, inspection, and many others. A bibliography is included at the end of each chapter listing the important codes, standards, books and technical articles on the subject of the chapter for those seeking further information.

Welding Handbook, edited by S. A. Greenberg. Cloth bound, 6 x 9 inches, 1651 pages. Published by American Welding Society, 33 W. 39th St., New York 18, N. Y. Price $12.

TECHNIQUES OF PLANT MAINTENANCE

In connection with a plant maintenance show that was held in Cleveland in January, 1950, there was a conference and forum on the same subject during which a number of timely talks were made and answers given to a large number of questions that were presented by the audience.

The plant maintenance show, and its accompanying conference provided the first major forum for an exchange of ideas among manufacturers, engineers and users, on basic tactics and strategy to be employed.

Twenty-two of the talks that were given at the conference are included in Part 1 of Techniques of Plant Maintenance—1950, and answers to 554 questions that were submitted are given in Part 2 of this two-volume text.

Subjects covered include maintenance organization and principles; maintenance costs and budgeting; selection and upkeep of lighting equipment; upkeep and motors, controls and distribution equipment; use of electrical instruments in maintenance; upkeep of floors, walls and roofs; sanitation and housekeeping; lubrication; application of service equipment; protection of plant and worker; importance of maintenance to safety.

Techniques of Plant Maintenance—1950. Paper bound, 278 typewritten reproduced pages, 8½ x 11 inches. Published by Clapp & Poliak, Inc., 341 Madison

Avenue, New York 17, N. Y. Price for two-volume set, $2.

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CODE FOR SCOTCH TYPE BOILERS.—A printed revised code is available for Scotch type boilers (over 15 lb per sq in. working pressure) designed in accordance with the Boiler Construction Code for Power Boilers of the American Society of Mechanical Engineers. The SBI ratings for Scotch type boilers contained in this publication are the recommended ratings for specific load requirements. The booklet has been divided into six sections to cover purpose of the code, terms, ratings, boiler markings, and procedure for obtaining SBI rating and SBI symbol. For a copy, write to the Steel Boiler Institute, 1207 Land Title Building, Philadelphia 10, Pa.

EQUILIBRIUM CONSTANTS FOR GAS REACTIONS.—A study was undertaken by the Engineering Experiment Station of Purdue University to collect data on the equilibrium constants of gas reactions. The results of this study are reported in "Equilibrium Constants for Seventeen Gas Reactions." The work was conducted by G. A. Hawkins, professor of thermodynamics, Purdue University, and J. M. Smith, professor of chemical engineering, Purdue University. As part of this 12-page booklet, there are four folded charts which give information regarding the equilibrium constant versus temperature K. Engineering Experiment Station, Purdue University, Lafayette, Ind.

WINTER AIR CONDITIONING SYSTEMS.—The fourth edition of Manual No. 9, covering the design and installation of warm air winter air conditioning systems, has just been published. The principle revision of this edition over the previous one has been the addition of a new table of rectangular duct equivalents for round pipe dimensions in accordance with the latest formula recommended by the ASHVE. Other changes include text revisions in the interest of clarity and simplification, together with dimensional changes in the equivalent length measurements of a number of fittings. The worksheets that are part of this manual have also been revised in accordance with changes made in this edition. While it is the purpose of this manual to provide an accurate method for the design of winter air conditioning systems, use of Manual 3 on heat loss calculations is recommended for determining the size of the heating system to install. National Warm Air Heating and Air Conditioning Association, 145 Public Square, Cleveland 14, Ohio. Price, 60 cents.

MEASURING HEAT LOSSES.—The third edition of Manual 3 is now available covering the measuring of heat losses. This manual includes a new table with total area, perimeter crackage and opening crackage figures for standard width metal casement windows for residences. Data are also given for full area of multiple light double-hung windows and the running feet of crackage for the double-hung window. Published by the National Warm Air Heating and Air Conditioning Association, 145 Public Square, Cleveland 14, Ohio. Price, 60 cents.

HEATING VALUE OF AMERICAN COALS—The average heat content of coals produced in the United States are listed in Information Circular 7538, to show the values compiled both by rank or class and according to the 27 states in which the coal is mined. All ranks of coal, from anthracite to lignite, are included. Bureau of Mines, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa.

FLAMMABILITY OF COMMON SOLVENT VAPORS—The Underwriters' Laboratories, Inc., has just issued a research bulletin on the lower limit of flammability and the autogenous ignition temperature of certain common solvent vapors encountered in ovens. This bulletin reports an investigation to determine the lower limit of flammability and the autogenous ignition temperature of 19 different solvents. The autogenous temperature of many solvents included in this investigation is within the range of temperatures encountered in industrial ovens. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill.

MODULAR COORDINATION — A 20-page booklet to explain modular coordination—what it is, how it functions, and how it will help reduce building costs. The booklet, which is prepared for both the layman and industry, is the first in a series as part of a program directed toward securing a wider understanding of the subject and of how it can benefit industry. Benefits of standardization are said to be of considerable value to the building industry and to architects. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, 15 cents.

GAS BURNER HANDBOOK — Fundamentals of gas combustion, furnace efficiency, venting, draft diverters, chimney efficiency and a check list of the possible causes and corrections of service calls are contained in field service information for Handley-Brown gas conversion burners. It was written by Glen White, chief engineer of the company, a member of AGA Technical Advisory Group for Domestic Water Heating Research. Handley-Brown Heater Co., Jackson, Michigan. Price, 50 cents.

CONVECTORS—Printed copies of Simplified Practice Recommendation R238-50, Convectors, are now available, according to an announcement by the National Bureau of Standards. The recommendation was proposed jointly by the Convector Manufacturers Association and the Institute of Boiler and Radiator Manufacturers, and was developed cooperatively by producers, distributors, users, and others concerned, through the established procedure of the Commodity Standards Division of the Bureau. The recommendation is basically a simplified list of sizes and types of convectors used for heating houses, apartments, offices, schools and ships. The simplified list will represent a substantial reduction in the number of combinations, and should afford an adequate selection for ordinary use and for stock. Superintendent of Documents, Government Printing Office, Washington 25, D. C. Price, 5 cents.

DEGREE-DAYS FOR FEBRUARY, 1950

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 22nd Year of Publication of Monthly Degree-Day Data

City	February			Cumulative, September 1 to February 28.			Heating Season[1]
	1950	1949	Normal	1949-50	1948-49	Normal	Normal
Abilene, Texas (A)	340	463	510	1751	2331	1761	2061
Albany, New York (A)	1241	999	1142	4773	4472	4868	6580
Albuquerque, New Mexico (A)	560	777	692	3085	3745	3443	4298
Alpena, Michigan (C)	1216	1125	1278	5201	4843	5660	8299*
Anaconda, Montana (C)	1001	1219	1164	5754	6556	5656	8357**
Asheville, North Carolina (C)	585	517	756	2523	2569	3276	4232
Atlanta, Georgia (C)	394	378	557	1769	1798	2370	2890
Atlantic City, New Jersey (C)	774	672	904	2840	2834	3631	5176
Augusta, Georgia (A)	315	250	423	1311	1222	1864	2161
Baker, Oregon (C)	940	1051	991	5025	5995	5024	7163
Baltimore, Maryland (C)	765	592	843	2688	2701	3462	4533
Billings, Montana (A)	865	1333	1120	5482	5879	5254	7119
Binghamton, New York (C)	1092	904	1182	4292	4161	4965	6808
Birmingham, Alabama (A)	354	378	521	1614	1753	2023	2352
Bismarck, North Dakota (A)	1599	1756	1548	7338	7048	6869	9192
Block Island, Rhode Island (C)	931	788	983	3314	3240	3767	5788
Boise, Idaho (A)	827	960	848	4379	5266	4230	5552
Boston, Massachusetts (A)	1029	855	1042	3766	3565	4322	6045
Boseman, Montana (C)	975	1240	1208	5638	6420	5897	8521**
Buffalo, New York (A)	1117	930	1156	4316	4094	4768	6822
Burlington, Iowa (A)	1062	1112	(a)	4415	4664	(a)	(a)
Burlington, Vermont (A)	1338	1151	1294	5243	4875	5496	7514
Butte, Montana (C)	1059	1326	1143	5986	6966	5635	8235**
Cairo, Illinois (C)	629	618	762	2574	2695	3169	3909
Canton, New York (C)	1383	1155	1328	5416	4989	5842	8020
Charleston, South Carolina (C)	234	196	372	969	843	1491	1769
Charlotte, North Carolina (C)	462	390	588	1948	1837	2533	3120
Chattanooga, Tennessee (A)	479	454	602	2112	2195	2559	3118
Cheyenne, Wyoming (A)	870	1108	1075	4774	5624	5179	7466
Chicago, Illinois (C)	1012	987	1039	4014	4035	4401	6077
Cincinnati, Ohio (C)	759	660	862	2928	2993	3675	4684
Cleveland, Ohio (A)	996	862	1075	3939	3846	4441	6155
Columbia, Missouri (C)	800	856	897	3421	3714	3903	4922
Columbia, South Carolina (C)	347	268	498	1473	1311	2000	2364
Columbus, Ohio (C)	882	758	778	3463	3433	4113	5398
Concord, New Hampshire (A)	1292	1065	1240	5154	4753	5321	7353
Concordia, Kansas (C)	854	1054	970	3928	4535	4173	5315
Dallas, Texas (A)	334	465	493	1624	2077	1980	2256
Davenport, Iowa (C)	1092	1085	1140	4403	4519	4825	6289
Dayton, Ohio (A)	932	830	980	3787	3793	4043	5264
Deer Lodge, Montana (C)	999	1281	1175	5864	6897	6069	8672**
Denver, Colorado (C)	681	879	918	3595	4501	4273	5874
Des Moines, Iowa (C)	1145	1229	1173	4697	4900	4935	6384
Detroit, Michigan (A)	1070	962	1134	4294	4145	4718	6490
Devils Lake, North Dakota (C)	1696	1861	1551	7920	7475	7371	9970
Dodge City, Kansas (A)	714	921	890	3549	4299	3958	5035
Dubuque, Iowa (C)	1159	1197	1218	4873	4926	5194	6790
Duluth, Minnesota (C)	1389	1514	1464	6702	6220	6680	9483
Eastport, Maine (C)	1262	1110	1232	4981	4844	5502	8520**
Elkins, West Virginia (A)	856	782	991	3692	3709	4256	5697
El Paso, Texas (A)	320	473	434	1873	2521	2101	2428
Ely, Nevada (A)	889	1398	(a)	5129	6574	(a)	(a)
Erie, Pennsylvania (C)	1003	846	1098	3804	3677	4434	6273
Escanaba, Michigan (C)	1318	1281	1340	5763	5343	6028	8771
Evansville, Indiana (A)	737	731	854	3053	3181	3348	4244
Fort Smith, Arkansas (A)	505	561	630	2382	2655	2657	3147
Fort Wayne, Indiana (A)	1052	918	1098	4233	4168	4503	5925
Fort Worth, Texas (A)	335	457	498	1681	2059	1904	2148
Fresno, California (A)	370	499	389	2080	2367	1883	2334
Galveston, Texas (C)	88	185	255	486	822	938	1016
Grand Junction, Colorado (A)	854	1252	863	4330	5142	4374	5548
Grand Rapids, Michigan (C)	1078	1005	1204	4375	4261	4863	6535
Green Bay, Wisconsin (C)	1346	1306	1358	5799	5349	5778	7825
Greensboro, North Carolina (A)	628	495	678	2529	2426	2845	3529
Greenville, South Carolina (A)	466	422	661	2086	1980	2739	3380
Harrisburg, Pennsylvania (A)	918	776	1008	3569	3557	4077	5375
Hartford, Connecticut (A)	1068	897	1100	4144	3930	4416	6036
Hatteras, North Carolina (C)	347	319	535	1249	1328	1851	2571
Havre, Montana (C)	1298	1612	1450	6916	6852	6388	8700
Helena, Montana (A)	952	1412	1178	6191	6869	5611	7894**
Houston, Texas (C)	131	188	277	647	997	1092	1157
Huron, South Dakota (A)	1360	1492	1340	6151	6225	6075	8004
Indianapolis, Indiana (A)	927	838	969	3740	3832	4099	5298
Jackson, Mississippi (A)	271	315	(a)	1240	1435	(a)	(a)
Kansas City, Missouri (A)	821	913	946	3495	3848	3953	4956
Knoxville, Tennessee (A)	526	486	666	2288	2356	2964	3670
La Crosse, Wisconsin (A)	1370	1378	1265	5798	5610	5578	7322
Lander, Wyoming (A)	930	1308	1155	5429	6520	5666	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 106]

Degree-Days for February, 1950 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 22nd Year of Publication of Monthly Degree-Day Data

City	February			Cumulative, September 1 to February 28.			Heating Season[1]
	1950	1949	Normal	1949-50	1948-49	Normal	Normal
Lansing, Michigan (A)	1146	1056	1201	4731	4570	5202	7048
Lewiston, Maine (O)	1291	1108	1243	5117	4686	5532	7707
Lincoln, Nebraska (C)	1005	1189	1131	4405	4975	4643	5999
Little Rock, Arkansas (A)	489	476	582	2057	2284	2380	2811
Livingston, Montana (C)	825	1160	1067	5049	5686	5018	7245**
Los Angeles, California (C)	228	348	266	1085	1420	1016	1504
Louisville, Kentucky (A)	720	662	801	2882	2976	3327	4180
Lynchburg, Virginia (A)	705	550	730	2737	2708	3143	3980
Macon, Georgia (A)	281	270	462	1274	1354	1908	2201
Madison, Wisconsin (C)	1223	1250	1299	5142	5108	5557	7429
Marquette, Michigan (C)	1271	1284	1361	5738	5363	5915	8693*
Memphis, Tennessee (A)	488	489	599	2099	2259	2470	2950
Meridian, Mississippi (C)	287	319	454	1339	1425	1891	2160
Milwaukee, Wisconsin (A)	1144	1158	1201	4868	4767	5185	7245
Minneapolis, Minnesota (A)	1356	1449	1400	5963	5807	5950	7850
Montgomery, Alabama (C)	237	237	392	1080	1151	1676	1884
Nantucket, Massachusetts (A)	931	832	974	3540	3518	3912	5957
Nashville, Tennessee (A)	582	561	675	2433	2460	2850	3507
New Haven, Connecticut (A)	904	844	1011	3839	3653	4230	5895
New Orleans, Louisiana (C)	124	120	230	540	719	965	1024
New York, N. Y. (C)	893	731	953	3085	3043	3837	5274***
Nome, Alaska† (A)	1603	1848	1990	6221	7618	7226	14580**
Norfolk, Virginia (C)	543	420	650	1857	1845	2583	3350
North Head, Washington (C)	626	684	622	3284	3576	3132	5452**
North Platte, Nebraska (A)	935	1127	1020	4695	5276	4806	6366
Oakland, California (A)	411	523	403	2127	2482	2029	3143**
Oklahoma City, Oklahoma (C)	530	681	742	2580	3020	2986	3613
Omaha, Nebraska (A)	1101	1247	1126	4637	5021	4765	6131
Oswego, New York (C)	1140	965	1162	4428	4237	4933	7088
Parkersburg, W. Virginia (C)	769	659	879	3121	3141	3701	4775
Peoria, Illinois (A)	1062	1050	1067	4267	4382	4673	6109
Philadelphia, Pennsylvania (C)	849	675	881	2949	2900	3542	4737***
Phoenix, Arizona (C)	137	341	263	1020	1634	1253	1405
Pittsburgh, Pennsylvania (C)	858	704	944	3324	3254	3947	5235
Pocatello, Idaho (A)	968	1099	986	4966	5912	4853	6655
Portland, Maine (A)	1301	1085	1162	5078	4725	5088	7218
Portland, Oregon (C)	640	662	644	3291	3544	3174	4469
Providence, Rhode Island (C)	1016	801	1070	3705	3451	4316	6015
Pueblo, Colorado (A)	704	891	916	3672	4552	4140	5514
Raleigh, North Carolina (C)	515	420	630	1941	1935	2605	3234
Rapid City, South Dakota (A)	976	1329	1119	5350	5818	5140	7118
Reading, Pennsylvania (C)	895	747	980	3344	3282	4082	5389
Red Bluff, California (A)	422	547	(a)	2205	2494	(a)	(a)
Reno, Nevada (A)	724	976	823	4155	5134	4149	5892
Richmond, Virginia (C)	645	487	695	2331	2320	2906	3695
Rochester, New York (A)	1132	960	1159	4482	4262	4825	6732
Roseburg, Oregon (C)	(a)	612	605	(a)	3498	3090	4428
Roswell, New Mexico (A)	461	612	580	2518	3257	2876	3484
Sacramento, California (C)	370	514	426	2031	2448	2036	2653
St. Joseph, Missouri (A)	908	1050	974	3992	4337	4121	5161
St. Louis, Missouri (C)	771	782	854	3066	3321	3652	4585
Salt Lake City, Utah (A)	805	1183	885	4268	5431	4144	5555
San Antonio, Texas (A)	228	240	274	915	1400	1128	1202
San Diego, California (A)	258	344	280	1107	1437	1099	1645
Sandusky, Ohio (C)	966	851	1061	3737	3759	4384	6208
San Francisco, California (C)	360	466	356	1846	2200	1770	3264**
Sault Ste. Marie, Michigan (A)	1424	1301	1487	6195	5691	6315	9285**
Savannah, Georgia (A)	222	161	316	917	805	1323	1490
Scranton, Pennsylvania (C)	1028	863	1106	4010	3896	4552	6129
Seattle, Washington (C)	604	704	647	3393	3659	3297	4934**
Sheridan, Wyoming (A)	1025	1317	1160	5653	6090	5789	8008
Shreveport, Louisana (A)	298	342	412	1368	1675	1736	1938
Sioux City, Iowa (A)	1222	1382	1260	5288	5687	5278	6898
Spokane, Washington (A)	980	1078	952	5382	5870	4707	6355
Springfield, Illinois (C)	907	899	1008	3620	3797	4191	5373
Springfield, Missouri (A)	719	739	876	3248	3471	3523	4428
Syracuse, New York (A)	1187	960	1212	4491	4289	4980	6893
Tacoma, Washington (C)	638	723	675	3587	3896	3438	5181**
Terre Haute, Indiana (A)	896	822	966	3638	3723	3876	4872
Toledo, Ohio (A)	1047	913	1075	4214	4120	4467	6077
Topeka, Kansas (C)	801	951	935	3628	3980	3953	4969
Trenton, New Jersey (C)	905	734	941	3299	3182	3715	4933
Utica, New York (O)	1234	870	1181	4677	4070	4966	6796
Valentine, Nebraska (C)	1046	1240	1130	5239	5740	5225	7039
Walla Walla, Washington (C)	841	824	778	4150	4487	3676	4808
Washington, D. C. (C)	732	576	848	2636	2707	3559	4626
Wichita, Kansas (A)	710	899	896	3339	3884	3773	4673
Williston, North Dakota (C)	1450	1734	1495	7385	7134	6958	9323
Winnemucca, Nevada (C)	796	1020	905	4522	5448	4644	6427**
Yakima, Washington (A)	991	989	846	4904	5307	4433	5599

(a) Data not available.
†Nome data are for January.

*Includes August.
**Includes July and August
***New 48-year normal covering 1898 to 1946

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

NEW CATALOGS

Mechanical Draft Fans

Centrifugal fans for mechanical draft in various applications are described in a 34-page catalog. Fan construction, installation details, performance characteristics, and driving arrangements are shown for both forced and induced draft equipment.—*Buffalo Forge Co., P. O. Box 985, Buffalo 5, N. Y.*

Item 52

Convector Radiators

A 16-page, 2-color booklet, prepared by the Convector Manufacturers Association, covers heating with convector radiators as a guide for new home owners. Selection of heating system, convector types and advantages, installation techniques, and cost comparisons are included. Space is provided for imprinting names of contractors and distributors.—*Convector Manufacturers Association, 221 N. LaSalle St., Chicago, Ill.*

Item 53

V-Belt Check List

Suggestions to help users determine the exact condition of their V-belt drives are contained in a 4-page inventory survey check list. The standards carried in the check list make it possible for users to decide which of their belt sets are satisfactory as is, which will shortly require replacement, and which need immediate replacement. The survey is designed to cover the drive problems in most plants. The same categories prevail for the condition of sheaves with the addition of a fourth—those that are obsolete, and a fifth for entire drives—those that need re-engineering.—*Allis-Chalmers Mfg. Co., Milwaukee, Wis.*

Item 54

Varidrive Motors

U. S. Varidrive motors, offering "Any speed—any time—with any load," are described and illustrated in full color in a 16-page catalog with phantom drawings showing operating principles, and charts illustrating proper tension, operating techniques and control selection.—*U. S. Electrical Motors, Inc., Milford, Conn.*

Item 55

Aluminum Shade Screening

Data and charts, showing the reduction of solar heat load passing through windows during the hot middle hours of summer days, are contained in a 16-page booklet on Kaiser aluminum shade screening. Diagrams show how sun rays are blocked off by rows of carefully angled louvers.—*Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, Calif.*

Item 56

Dust Suppression Equipment

Two new bulletins, covering Whiting wet-type Hydro-Clone dust and fume suppressors, describe horizontal and vertical types, respectively. Both bulletins contain cutaway illustrations which explain Hydro-Clone operation, dimension tables for the various size units, and installation photos of Hydro-Clones in operation.—*Whiting Corp., Harvey, Ill.*

Item 57

Power Exhausters

Chicago Gyra-Flo power exhausters are described and illustrated in a 4-page folder with cutaway drawings, sizing and performance tables.—*Chicago Blower Corp., 4558 West Congress St., Chicago 24, Ill.*

Item 58

Rubber-Lined Pipe

An 8-page catalog section on rubber-lined pipe, fittings and valves gives design, construction and service recommendations, lists many uses and pictures and describes the products. These include, besides rubber-lined pipe, gaskets for flanged pipe assembly, expansion joints, Flexseal connectors to reduce vibration in lines, Vulcalock valves, rubber-lined and relinable valves. Specifications and data are listed.—*The B. F. Goodrich Co., Akron, Ohio.*

Item 59

Standardaire Blower

Publication No. 86 presents a handy selection chart and lists the various capacities possible in the Standardaire blower when direct connected to standard speed motors.—*The Standard Stoker Co., Inc., 370 Lexington Ave., New York 17, N. Y.*

Item 60

Dust Collectors

A 16-page catalog, No. 2505-5, provides information on the new Prat-Daniel Valmont Type S dust collector and the Standard Type HC. The booklet describes the high narrow inlet slot, a feature of the Valmont Type S, claimed to increase collection efficiency in the range below 20 microns. A nomograph chart is included for determining number of tubes required for a given capacity, temperature and resistance, followed by tables for determining dimensions of the collector for any number of required tubes.—*The Thermix Corp., Greenwich, Conn.*

Item 61

Low-Temperature Insulation

A 20-page book on the use of Rubatex R-103-S Insulation Hardboard for low-temperature insulation purposes contains detailed information for use by design and construction engineers in applying the product in buildings and in manufactured products.—*Rubatex Division of Great American Industries, Inc., Bedford, Va.*

Item 62

Exhaust Fans

Emerson-Electric exhaust fans for business, industrial and institutional buildings are illustrated and described in a 16-page catalog. Electric direct-drive and belt-drive exhaust fans as well as window and ventilating fans are included. — *The Emerson Electric Mfg. Co., St. Louis 21, Mo.*

Item 63

Vibration Control Data

Characteristics of the various types of vibration isolation media—springs, rubber, and cork materials—are given in a new bulletin, G-102.—*The Korfund Company, Inc., 48-01-S 32nd Place, Long Island City 1, N. Y.*

Item 64

Dust Collectors

A new 12-page catalog, No. DC-49-3, describes Duclone collectors for industrial dust control and recovery. Construction and operating features, efficiency curves, schematic drawings of different industrial applications, and other pertinent data are included.—*The Ducon Co., Mineola, N. Y.*

Item 65

Coil Data Sheets

New ring punched catalog sheets covering capacity ratings of steam coils, prices, dimensions, Marlo air conditioning units, etc., have been issued with a catalog check list for bringing Marlo catalog data up to date. —*Marlo Coil Co., 6135 Manchester Ave., St. Louis 10, Mo.*

Item 66

Insulating Products

An 8-page catalog, No. 2350, covers standard asbestos and insulating products used in the heating, ventilating and air conditioning industry.

With a completely cross-indexed table of contents for easy and quick reference, the book was compiled to answer three questions: (1) What does the product look like? (2) Where is it used? (3) What service will it give?

The back page is devoted to data tables, referred to in the copy of the catalog.—*Grant Wilson, Inc., 141 W. Jackson Blvd., Chicago 4, Ill.*

Item 67

Marvair Heat Pump

A series of new literature releases covers Marvair heat pumps, the gas Marvair unit for year-round comfort, and technical data on electric and gas-fired heat pumps. Data include a map of water temperatures in the United States, refrigeration circuits, comparative costs, and performance data. Dimensions and capacities are set forth in specification sheets.—*Muncie Gear Works Inc., Muncie, Ind.*

Item 68

Revised Micarta Data Book

The recently revised 36-page Micarta Data Book, B-3184-D, published as a working tool for the designer and user of industrial materials, presents technical facts about Micarta, grades and forms in which Micarta is supplied, and chemical, mechanical and electrical properties of each. Standard shapes and sizes available are listed, and a description of finishes is included.—*Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.*

Item 69

Ornamental Grilles

A 48-page catalog presents a large selection of ornamental grille patterns, including original designs—both classic and modern. Photographs, dimensional diagrams, tables, and descriptive copy cover special grilles, fixed louvers, movable louvers, patented "Grilframes," special panels and enclosures, etc.—*Harrington & King Perforating Co., 5655 Fillmore St., Chicago 44, Ill.*

Item 70

Chart for Selecting Reducing Valves

A pressure reducing valve selection chart is useful to anyone who has to specify valves occasionally and who does not have all the engineering background necessary to do the job easily. By reference to the service for which the valve is intended, the reduced pressure limits and other factors, selection of the correct valve can be made easily and expertly. Used in conjunction with Klipfel Bulletin 148, the chart also helps determine proper sizes of valves.—*Klipfel Valves, Inc., Division of Hamilton-Thomas Corp., Hamilton, Ohio.*

Item 71

Shutters and Dampers

Catalog No. 44 covers Air-Flo automatic and manually operating shutters and dampers, with sizing and operation data.—*Air Conditioning Products Co., 2340 W. Lafayette Blvd., Detroit 16, Mich.*

Item 72

APRIL, 1950

TO OBTAIN COPIES OF TRADE LITERATURE listed in this issue, circle on the list below the publication wanted, using item number at the end of each review. Print your name and address, mail to

Editor, HEATING AND VENTILATING,
148 Lafayette Street, New York 13, N. Y.

52	53	54	55	56	57	58
59	60	61	62	63	64	65
66	67	68	69	70	71	72

Name.....

Title (Must be shown).....

Firm (Must be shown).....

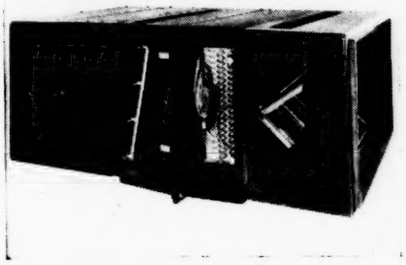
Business Address.....

City.....Zone....State.....4/50

NEWS OF EQUIPMENT AND MATERIALS

Westinghouse Air Handling Unit

NAME—Westinghouse air handling unit, types AH and AV.
PURPOSE—Air handling unit for re-

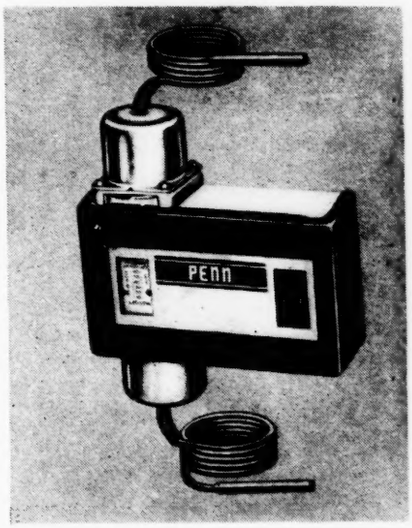


mote installation in a central plant type of air conditioning system.
FEATURES—Of standardized design and construction, each unit consists of a fan section with two backwardly inclined blade Silentvane type fan wheels mounted on a common shaft, and a coil section with drain pan for cooling and heating coils, depending upon the requirements. Filter sections, face and by-pass dampers, as well as other accessories, are available. Fan section is composed of a fabricated steel angle frame enclosing the double fan unit with its shaft and bearings and supporting the motor and drive. Motor and drive can be mounted at either end and the exhaust outlet positioned for horizontal or vertical discharge. The two fans discharge through a common outlet flanged for connection with duct work. Coil section consists of an angle iron frame with insulated panels, and accommodates the standard heating and ventilating coils and the dampers. Cooling and dehumidifying are provided for summer operation; heating and humidifying for winter use.
LITERATURE AVAILABLE — Bulletin 102-720.
MADE BY — *Sturtevant Division, Westinghouse Electric Corp., Hyde Park, Boston 36, Mass.*

Item 123

Refrigeration Control

NAME—Penn Electric control, Type 275.
PURPOSE—Control to provide positive protection against oil pressure failure on pressure lubricated refrigeration compressors.
FEATURES—Control is actuated by the difference in pressure between the lubricating oil and the suction pressure of the compressor. The control incorporates two bellows-type power elements, one of which may be connected to the pressure line of the lubricating oil pump and the other connected with the crankcase pressure of the refrigeration compressor. A trip-free delay device with manual reset is wired as an integral part of the control. If the required pressure difference is not established in 90 seconds, the control contacts open and the compressor stopped. Manual reset is then required. If the oil pressure drops below a safe minimum during

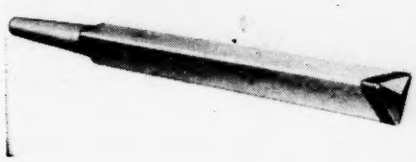


a running cycle, this time delay permits the compressor to continue running for 90 seconds before shutting down. Control is designed for 50 to 60 cycles and 115 volts a-c or d-c, or 208 to 230 volts a-c or d-c. It can be used with either ammonia or non-corrosive refrigerants.
MADE BY — *Penn Electric Switch Co., Goshen, Ind.*

Item 124

Tri-Point Rock Drill

NAME—Tri-Point rock drill.
PURPOSE — For drilling through granite, sandstone, hard limestone, or concrete.
FEATURES—Cutting tips are made of the vacuum sintered cemented carbide made by this company. The triangular-shaped design of the thick carbide tips is said to provide maximum resistance to wear and



shock, and freedom from packing. Drill shanks are heat-treated alloy steel. Drills are used in air or electric hammer type drills.
SIZES AND CAPACITIES—Diameters range from ⅜ to 1 inch and lengths from 7⅜ to 12-inch.
LITERATURE AVAILABLE — Leaflet K-111.
MADE BY — *Kennametal Inc., Latrobe, Pa.*

Item 125

Kaufman Dehydrator

NAME—Kaufman junior size dehydrator, Type AB.
PURPOSE — Dehydration of small spaces and building basements.
FEATURES—Dehydrator, which uses calcium chloride as a moisture absorbent, is capable of removing ½ lb of water from the air per hour. This absorbent capacity is based upon an air temperature of 70F and a relative humidity of 70%. The unit measures 12 inches wide, 18 inches long and 20 inches high and holds 20 lb of calcium chloride. It is said to be suitable for a basement of 2,500 cu ft. Automatic humidity control is optional. Fan is operated by a shaded pole, single phase 110-volt, 60-cycle motor. Dissolved chemical, no longer effective, is drained from unit.

MADE BY — *H. J. Kaufman Company, 13215 Roselawn Ave., Detroit 4, Mich.*

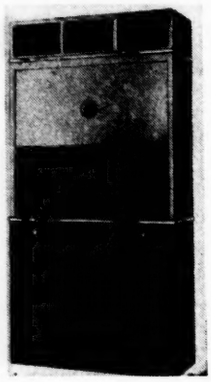
Item 126

Airtemp Conditioner

NAME—Airtemp packaged air conditioner.

PURPOSE—Space cooling.

FEATURES—An 8-ton packaged air conditioning unit has been added to the company's line which at present also includes 2, 3, and 5-ton sizes. The new unit has the Chrysler Airtemp sealed radial compressor, cushion mounted for quiet operation and sealed in a bath of oil for lifetime performance. The company's Maxi-Fin cooling coil is used. Two centrifugal type fans are installed in this unit, both mounted on sponge rubber to reduce vibration. Adjustable sheave motor pulleys are employed for speed regulation. Automatic low voltage and overload protection is built-in. When cooling is not necessary, fans may be operated solely for ventilation. A heating coil and a humidifier are available as optional equipment. Unit occupies only 6.5 sq ft of floor space when installed.



MADE BY—*Airtemp Division, Chrysler Corp., Dayton 1, Ohio.*

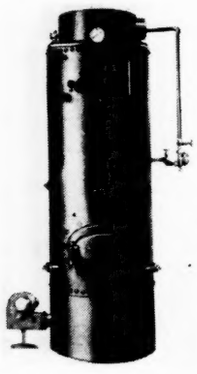
Item 127

York-Shipley Boiler

NAME — York-Shipley vertical tubular boiler.

PURPOSE — High pressure boiler-burner unit for commercial applications needing high pressure steam.

FEATURES—Unit operates in a vertical position with full length tubes. It consists of an outer shell, a smaller and shorter inner shell in the lower portion of the outer shell, a head in the upper end of each shell, and tubes joining and extending through each head. The inner shell forms the furnace. The firing opening extends through the shells into the furnace. Water in the outer shell surrounds the inner shell and the lower portions of the tubes. Boiler is designed for a maximum steam pressure of 100 lb per square inch. Shell and heads are fabricated from steel plates. Unit is equipped with a standard York-Shipley Model C-7, or N-19 or N-38 burner, depending upon the capacity required. Burner controls include primary stack control, high pressure boiler limit control and safety plugs built into the boiler at low-water level. Boiler has a steel base which serves as a boiler base and combustion chamber. An injector is furnished as regular equipment for supplying the boiler with water while under pressure.



SIZES AND CAPACITIES — Available in 5 sizes from 3 to 15 hp.

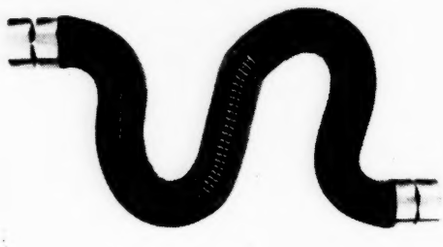
MADE BY — *York-Shipley, Inc., York, Pa.*

Item 128

Flexible Connector

NAME—Techniflex flexible insulated convector connector.

PURPOSE—Flexible connection for use in air conditioning installations



for connecting units to supply or return risers.

FEATURES—This connection may be used to hookup a convector unit while the convector may be from 3 to 4 ft from the wall. Once the connection is made, the convector may be placed in its permanent position allowing recessing of the unit without the customary installation which involves elbows and short nipples. The hose is made of ¾-inch sponge rubber and carries AGA certification. It will withstand any pressure normally encountered in a secondary circuit. Available in various thicknesses of rubber or types of insulation for specific temperature ranges. Unit, which is provided with ¾-inch I.P.T. female unions on each end, comes in lengths of 1 to 4 ft.

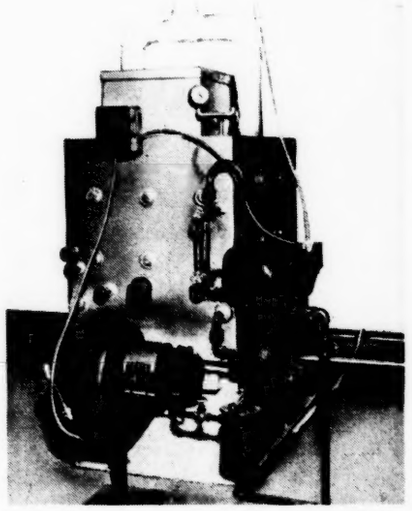
MADE BY—*Techniflex Corp., Port Jervis, N. Y.*

Item 129

Consolidated Boiler

NAME—Consolidated boiler, series 750.

PURPOSE—Generation of low pressure steam for process and industrial work.



FEATURES — Boiler produces three types of steam—saturated steam with temperatures as high as 290F; a steam with some saturation and temperatures as high as 400F, and a dry steam with temperatures up to 550F. All three types of steam, it is claimed, can be furnished at the same time or separately. Since the unit is fully automatic in operation, no licensed engineer is required. A rectangular flue construction design is used which is said to be self cleaning. The unit is delivered fully equipped for immediate installation. Everything is furnished, including controls. Boiler is constructed according to ASME code and Massachusetts standards.

SIZES AND CAPACITIES—12.5 hp designed for 15 lb per sq in. operating pressure.

LITERATURE AVAILABLE—Bulletin.

MADE BY — *Consolidated Boiler Corp., 126 Dartmouth St., Boston 16, Mass.*

Item 130

Hotstream Boiler

NAME—Hotstream gas-fired hot water boiler, Model H-193.

PURPOSE—For space heating homes up to 6 rooms or for installation as individual heating units for apartment and multi-family dwellings.

FEATURES — Heating unit consists of a precision drilled raised port burner with twin air mixer. Heating element has 3 nested spiral coils of heavy 1-inch O. D. seamless copper tubing. Installed in the unit are the following: Automatic pilot of the thermocouple type; gas pressure regulator; maximum and minimum water temperature limit control; automatic solenoid gas control valve. Heavy, metal shielded, asbestos air cell insulation is used to keep the cabinet cool. A manual shut-off valve is supplied for pilot and main burner and is an integral part of the automatic pilot valve.

SIZES AND CAPACITIES—For use in installations requiring up to 346 sq ft of hot water radiation. Output, 52,000 Btu per hr.

LITERATURE AVAILABLE—Bulletin.

MADE BY—*The Hotstream Heater Co., 2363 East 69th St., Cleveland, Ohio.*

Item 131

Lubralife Pillow Blocks

NAME—Lubralife self-aligning pillow blocks.

PURPOSE — Permanently lubricated pillow block designed to handle heavier loads and higher speeds than conventional bearings.

FEATURES — A cavity filled with sponge iron acts as a wick and this, together with exceptionally high porosity of the bearing metal, is said to insure adequate lubrication for the entire life of the bearing. The metal is impregnated with a special lubricant under pressure, filling both the sponge iron section and the pores in the metal. The lubricant provides a thin protective coating around the shaft without dripping oil. A floating ball and socket construction of the pillow block is said to assure perfect alignment. Bearings are available in both pillow block and flange mountings.

SIZES AND CAPACITIES—Made in bore sizes of ½, ⅝, ¾ and 1-inch.

MADE BY—*Congress Drives Division, Tann Corp., 3750 East Outer Drive, Detroit 34, Mich.*

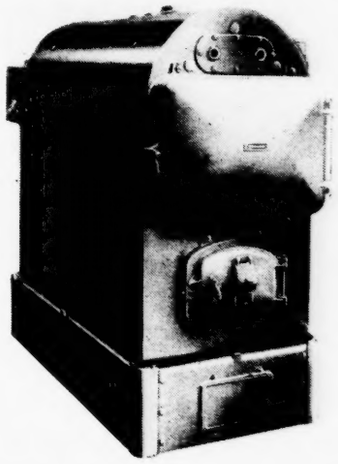
Item 132

Kewanee Boiler

NAME — Kewanee Square-Heat boiler, Type R.

PURPOSE—A steel boiler for use with oil, gas, stoker, or hand-fired coal operation and for the heating of medium sized buildings.

FEATURES — Boiler is designed to meet the code requirements of the ASME and the Steel Boiler Institute. Wide free waterways is said to provide rapid circulation. All primary heating surfaces closely face the radiant fire with a resulting high rate of heat transfer. On oil-gas boilers spinner blades are used to rotate the hot gases against the tube walls to assure maximum heat transfer to the boiler water. Doors are large enough to facilitate easy firing and inspection and are well insulated to prevent heat loss and warping. Special fittings facilitate use of fuel-burning method selected. For domestic hot water, a copper coil is brazed in bronze fittings and mounted on steel plate with locknuts and rubber gaskets. Tappings are provided for all essential safety devices and automatic firing controls.



SIZES AND CAPACITIES—Available in 8 sizes, or 900 to 3,000 sq ft of steam radiation and with mechanical firing, or 740 to 2,480 sq ft radiation with hand-fired coal.

LITERATURE AVAILABLE — Catalog 88-8.

MADE BY—*Kewanee Boiler Corp., Division of American Radiator and Standard Sanitary Corp., Kewanee, Ill.*

Item 133

Gas Conversion Burner

NAME—International gas conversion burner, Model 5R.

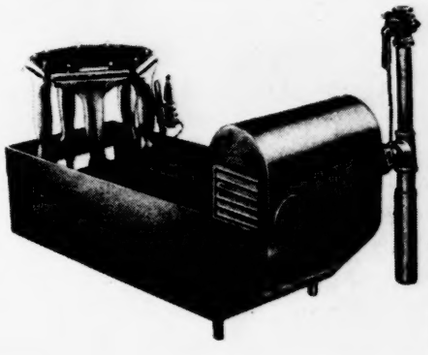
PURPOSE—Unit to permit the burning of gas in existing boiler.

FEATURES—Cast iron burners with large slotted ports at the sides direct heat towards the walls of the furnace and maintain, it is claimed, stable uniform combustion. Since the flame is directed toward the combustion chamber walls by the combustion air, which can be regulated by means of shutters on the burner cabinet, it is not necessary to plaster the burner in the combustion chamber. The automatic safety pilot, fully visible, is of stainless steel; also included is an automatic gas control valve with a stainless steel core, and a gas pressure regulator of the adjustable type. An air door is provided which allows the secondary air adjustment to remain stationary when the cover is removed.

SIZES AND CAPACITIES—Available in 100,000, 150,000 and 200,000 Btu input.

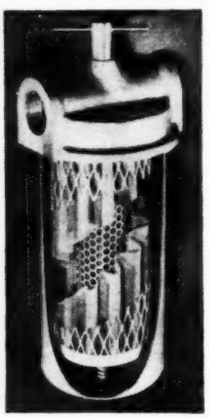
MADE BY—*International Oil Burner Corp., Gas Division, 3800 Park Ave., St. Louis, Mo.*

Item 134



Synclinal Filter

NAME—Marvel Synclinal filter.
PURPOSE—Filter which permits installation into any piping system carrying noncorrosive liquids.



FEATURES — A large amount of filtering area has been incorporated into a small space. When cleaning is required, by removing one hand nut, the entire filter may be disassembled. After cleaning, the entire assembly can be made easily without disturbing any of the pipe fittings. Except for gaskets, all parts are made of metal.
SIZES AND CAPACITIES — Available in a wide variety of wire mesh screens ranging from a coarse of 30 to a fine of 200. Capacity sizes are 5, 8, 10, 20, 30 and 50 gpm.
LITERATURE AVAILABLE—Bulletin.
MADE BY—*Marvel Engineering Co., 625 West Jackson Blvd., Chicago 6, Ill.*

Item 135

Daffin Humidifier

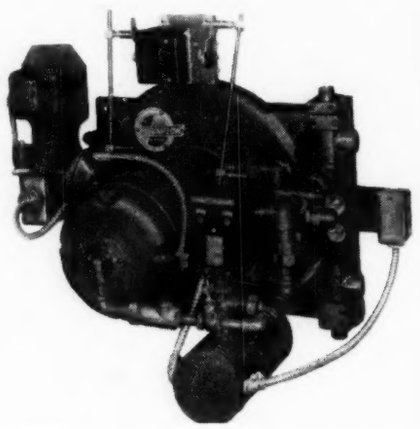
NAME—Hum-O-Zone.
PURPOSE—Heavy duty, high capacity humidifier for industrial use.
FEATURES—Unit employs a high pressure pump to break up the water into a fine spray. Water is atomized in the upper portion of the humidifier and siphoned into the air stream. Siphoning is said to eliminate necessity of using the conventional type baffle arrangement. Not only can the amount of air discharged be reduced or increased, but the moisture output is also adjustable to fit individual needs. Unit requires only a cold water supply and a connection to 110-volt a-c current. No water drain is necessary because the tank capacity is controlled by a float. The automatic control may be mounted on the wall within a radius of 25 ft of the unit.

SIZES AND CAPACITIES—Discharges 750 cfm of air. Measures 22 inches deep by 26 inches wide by 42 inches high.
MADE BY — *Daffin Manufacturing Co., North Prince Street Extended, Lancaster, Pa.*

Item 136

Ace Uniflow Burner

NAME—Ace Uniflow burner.
PURPOSE—An automatically operated oil burner using heavy oils and depending on electric-gas ignition.
FEATURES—Units embody oil pump, fan, electric motor and oil atomizer, with the necessary electrical or electronic controls. When the burner starts, an electric spark ignites the gas which in turn ignites the fuel oil. Once the oil has been ignited, the spark and gas are then shut off. An electric preheater on the burner unit close to the atomizer embodies a welded steel tank, thermal elements and a dual thermostatic regulator. The elements are set in steel wells to eliminate direct contact between oil and heating elements in order to avoid coking. Either steam or hot water may be used to heat the oil after the plant is in operation. The indirect heater also heats the return oil which is circulated back to the tank so that the oil in the storage tank is maintained at a suitable flowing temperature. All oil connections at the burner are made through openings on a cast swing manifold to eliminate packing joints and possible oil leaks. The oil burners swing out a full 90 deg to permit easy servicing.



SIZES AND CAPACITIES—Available in ten sizes with oil consumption from 4 to 165 gph and from 1,600 to 66,000 sq ft steam radiation.
LITERATURE AVAILABLE—Folder.
MADE BY—*Ace Engineering Co., 1435 West 15th St., Chicago 8, Ill.*

Item 137

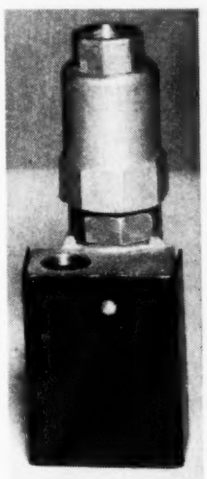
Reznor Unit Heater

NAME—Reznor gas unit heater.
PURPOSE—Space heating.
FEATURES — Burners installed in unit heater are one piece, raised port, machined from grey iron. Combustion chamber is made of 12-gage welded furnace steel with heavy finned and ribbed cast iron top plate. A Torrington fan with aluminum blades is used. A control delays action of fan until the air is heated to a desired temperature. When the temperature limit is reached, the gas is automatically shut off. Control manifold is a removable unit for easy installation and convenience in servicing. Hot, burned gases pass upward through several heat exchanger sections, a built-in diverter and flue chamber, and then through the connection to the flue.
SIZES AND CAPACITIES—Eight sizes with outputs from 20,750 to 166,000 Btu per hr.
LITERATURE AVAILABLE — Catalog No. U-50.
MADE BY—*Reznor Mfg. Co., Mercer, Pa.*

Item 138

G.E. Control

NAME—G.E. flow interlock.
PURPOSE—Control device which responds to the flow of cold water to open or close an electrical contact.
FEATURES—When a flow of water exceeds a preset amount, the control closes a contact and opens it when the flow falls below the preset amount. This device serves in a similar manner as a fuse in an electrical circuit where water cooling is relied on for protection. It can be used in hot water heaters, welding units, and a number of industrial applications. Adjustment can be made to control the circuit for any flow from 1 to 4 gpm. Flow differential between cut-in and cut-out of the electrical contact is 0.2 gallons minimum and 0.4 gallons maximum. Mechanism is available complete with union fitting and strainer attachment to keep out foreign material. Control is intended only for cold water applications and the electrical rating is 10 amperes at 125 volts a-c. Maximum line pressure is 125 lb per sq in.



MADE BY—*General Electric Co., Schenectady 5, N. Y.*

Item 139

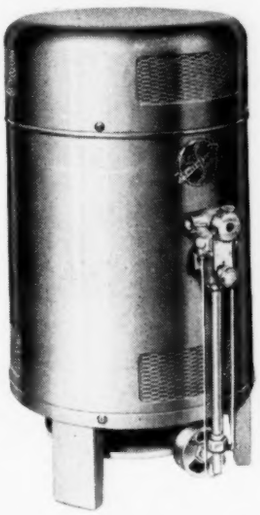
Metal Coating

NAME—Dampney metal coating.
PURPOSE—A vinyl formulation for pre-treatment of metal prior to the finish coating.
FEATURES—Coating is said to inhibit corrosion temporarily before the application of the finish coating and to provide a suitable surface for the finish coat. Primer is applied either by brush or spray to any type of clean metal. Only one coat is required, and the makers claim that one gallon protects from 800 to 1,000 sq ft of surface. No more than 30 minutes is required from the time the primer is applied until the metal is ready for the finish coating.
MADE BY—*The Dampney Company of America, Hyde Park, Boston 36, Mass.*

Item 140

Burkay Heater

NAME—Burkay water heater, Model No. 180.
PURPOSE—Water heater with large high temperature hot water generating capacity for use in restaurants, and other places requiring a large volume of hot water.
FEATURES—The unit normally takes warm water from the establishment's regular warm water source. Little piping is required and the 4½-gallon storage tank is self-contained within the unit. Heater has an input capacity of 40 000 Btu per hour and stores 4½ gallons of 180F water for rinsing operations. Unit measures 30 inches in height and 16 inches in diameter.

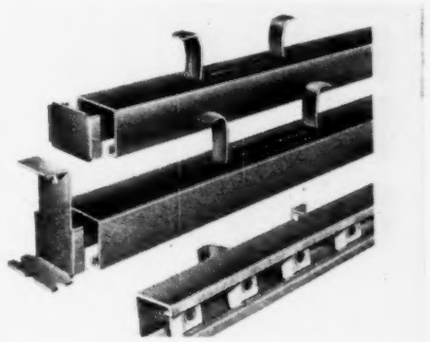


MADE BY—*A. O. Smith Corp., Toledo, Ohio.*

Item 141

Unistrut Concrete Insert

NAME—Unistrut Series P-3000.
PURPOSE — Concrete insert which permits attachments to be quickly and easily made at any point along the entire channel without disturbing other attachments on the channel.
FEATURES—With this insert a special spring nut is inserted into the channel at the point where the attachment is desired and bolting is required to the fitting. This bolting action secures the nut tight to the double track that is formed by the inturned edges of the channel. This channel measures 1⅝ inches by 1⅜ inches outside dimensions and is formed of 12-gage cold-rolled steel.



SIZES AND CAPACITIES — Available in lengths from 3 inches to 20 ft with Type A plain drive-in end caps or Type B anchor type drive-in end caps equipped with slots for centering and nailing. Load capacity is 2,000 lb per foot with a safety factor of 3.
LITERATURE AVAILABLE — Bulletin No. CI-2.
MADE BY — *Unistrut Products Co., 1013 W. Washington Blvd., Chicago 7, Ill.*

Item 142

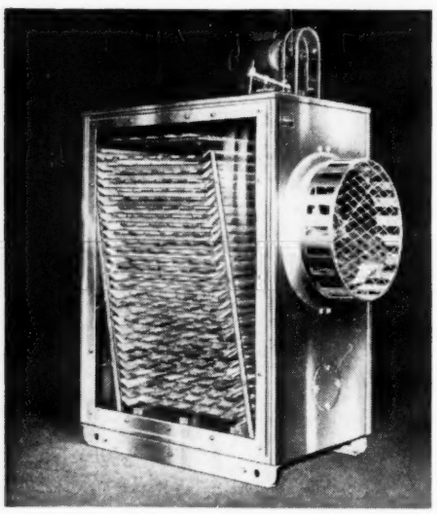
Tempchek Insulation

NAME—Carey Tempchek.
PURPOSE—Heat insulation material available as a pipe covering and in block form for temperatures up to 1,500F.
FEATURES—Insulation consists of silicas combined with asbestos fibers and bonding agents. Makers claim it is easily workable, forms tight joints, and is non-irritating, non-corrosive and easy to apply. The material is recommended for insulating superheated steam equipment in high temperature work, and for high temperature surfaces such as ovens, boiler walls, breechings, and furnaces.
MADE BY—*Philip Carey Mfg. Co., Cincinnati 15, Ohio.*

Item 143

Marley Aquatower

NAME—Aquatower.
PURPOSE — Compact water cooling tower.
FEATURES—Interiors of all towers are lined with a thick coating of

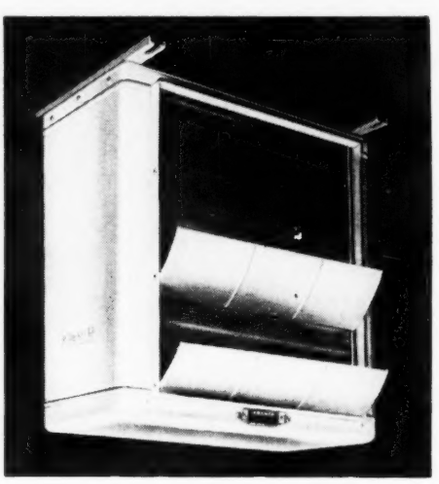


rubber which will make the tower interior impervious to corrosion. A quiet, deep pitch fan is used which operates at one-half the customary speed. The rubber lining of the tower plus the slow speed fan produce, it is said, unusually quiet operation. Units are a packaged product, completely assembled and ready to install. Casing and basin are of integrally welded construction employing heavy gage steel. Large towers have open distribution system with splash box, while small towers have removable covers with threaded inlet pipe at rear of distribution basin. California redwood nail-less filling is used throughout. Stamped aluminum fan blades are used on small towers, while cast aluminum fan blades are employed on large towers.
SIZES AND CAPACITIES — Available in sizes from 3 to 50 tons.
LITERATURE AVAILABLE — Bulletin AQ-50.
MADE BY — *The Marley Company, Inc., Kansas City 15, Kans.*

Item 144

Kramer Unit Cooler

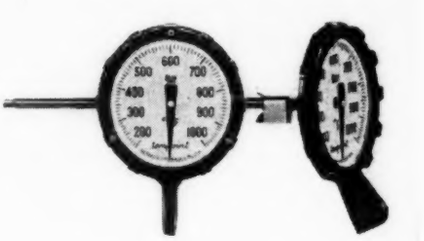
NAME—Kramer unit cooler, Model Kay-Tee.
PURPOSE—Unit for space cooling.
FEATURES—Tubes are closely spaced with a small fin overhang which results in a low fin to tube ratio and a high heat transfer factor. Tubing of each row is made of one continuous length with no joints. Since the coils are designed for normal pressure drop, standard expansion valves can be used. Units are not supplied with expansion valves. Cooler has a built-in heat exchanger and provisions are made for easy mounting of the expansion valve bulb at the proper location by extending a loop of the suction line outside of the unit. Unit is constructed of polished aluminum and mounting is made easy by the use of hanging brackets with a U-slot. Two large adjustable louvers permit adjustment of direction and diffusion of the air stream.
SIZES AND CAPACITIES — Available in seven sizes to balance a range of compressors from ¼ to 2 hp.
MADE BY — *Kramer-Trenton Co., Trenton, N. J.*



Item 145

Tempoint Dial Thermometer

NAME—Tempoint dial thermometer.
PURPOSE—Instrument designed for fast, accurate thermal response and for easy reading.
FEATURES—Thermometer has a 3-inch dia body and a stainless steel stem 5½ inches free length with only 2 inches immersion required to obtain accurate readings. A bimetal coil is used as a temperature indicating element. Expansion of this coil rotates an attached small shaft and moves the indicating pointer. A V-shape pointer is used.



Clear graduations and large numerals are marked on the dial.
LITERATURE AVAILABLE — Leaflet 775.
MADE BY — *Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh 8, Pa.*

Item 146

(Continued on page 116)

APRIL, 1950

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number found at the end of each item.

123	124	125	126	127	128	129
130	131	132	133	134	135	136
137	138	139	140	141	142	143
144	145	146	147	148	149	150

Print your name and address, detach and mail to
Editor, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

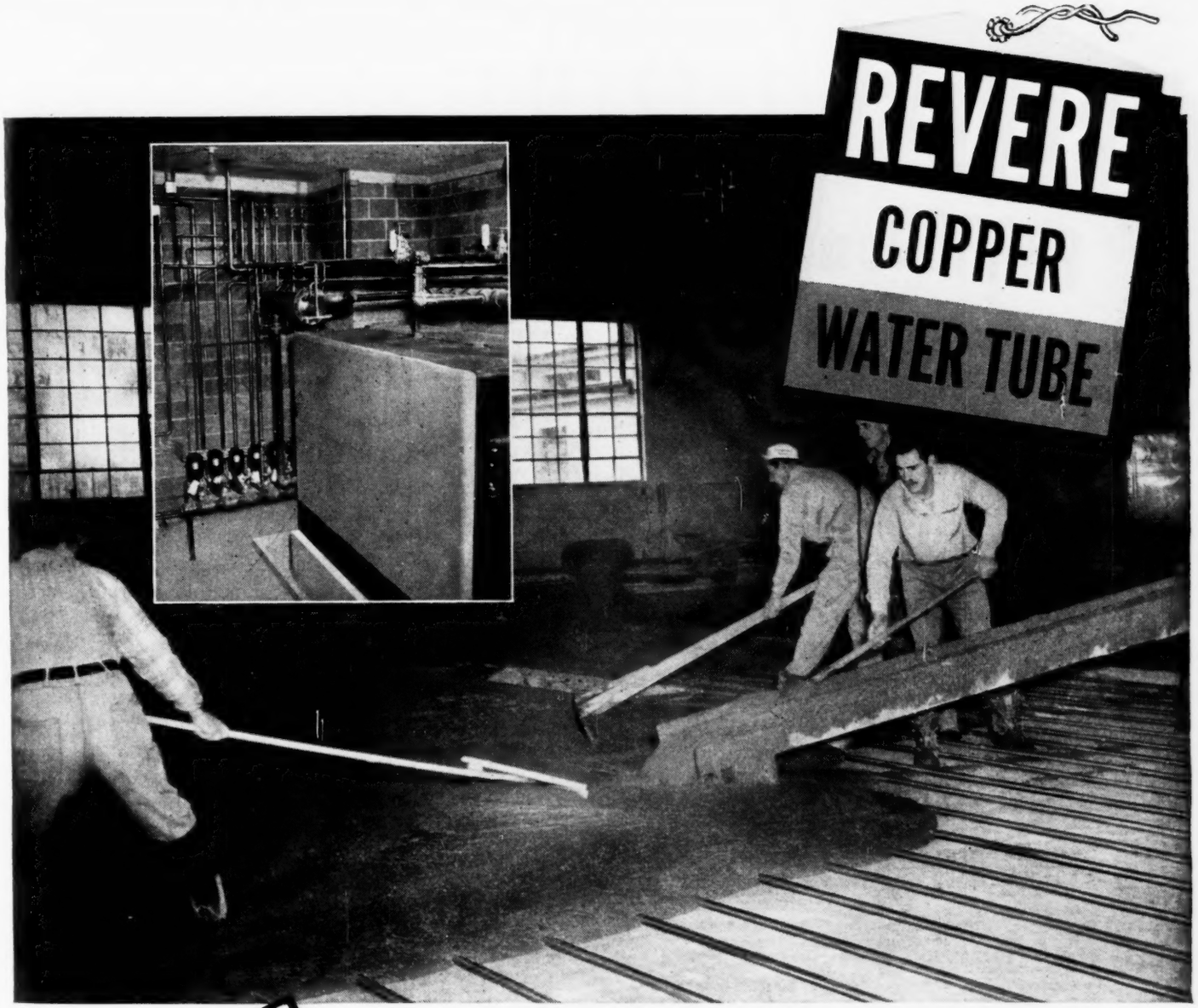
Name.....

Title (Must be shown).....

Firm (Must be shown).....
(For prompt service, title and firm name must be shown above.)

Business Address.....

City..... Zone.... State..... 1-50



OK

Concrete is being poured over 1" Type L Revere Copper Water Tube in this radiant panel heating installation at Driscoll Chevrolet Agency, Spring Valley, New York. Boiler and zone circulators are shown in inset.

Architect: Joseph M. Pilati, Pearl River; General Contractor: Harvey B. Keesler, Spring Valley; Heating and Plumbing Contractor: Irving Keesler, Spring Valley; Consulting Engineer: Roger M. Wells, Bayside, Long Island.

...for RADIANT HEATING

REVERE Copper Water Tube is used to advantage in either floor or ceiling installations of radiant panel heating. Its strength and resistance to corrosion assure long service. Joints made with solder fittings keep installation costs surprisingly low.

Hard temper Revere Copper Water Tube comes in straight lengths of 12 or 20 feet. Easy-to-bend soft temper tube is available in similar lengths or in long coils.

Revere Copper Water Tube is also suitable for industrial uses. Type B Copper Tube is available for installations requiring outside diameters of SPS pipe and brazed fittings; Red-Brass Pipe and Copper Pipe for use with threaded fittings.

Revere pipe and tube are handled by leading distributors in all parts of the country. The Revere Technical Advisory Service is always glad to serve you.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

. . .

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere.

New! Kennametal Masonry Drill

ZIPS through cement, brick, slate, marble

New trouble-free drill works in any direction, goes to any depth (up to 10 inches), drills faster . . . can save on time and cost.

New Kennametal "twist-type" masonry drill keeps drilling with no "time-out" for hole cleaning. Spiral flutes clean cuttings back as fast as they form. Drill operates easier, requires less power and push.

Super-tough Kennametal cemented carbide cutting edge resists wear, stays sharp — UP TO 100 TIMES AS LONG.

Buy Kennametal drills at your supply house.

Gets Money-Saving RESULTS!

"50 holes, ½ inches deep in tile, per grind. Speed — 40 seconds per hole."

"Average 100 holes, 3½" deep in cement between regrinds. Speed — 15 seconds per hole."

"Saved 7½ hours in one day with one drill. Saved money — had easier going."

Be set for any job with handy unit of assorted drill sizes. Kit holds ¼", 5/16", ⅜", ½" and 9/16". Tough plastic case resists water and oil.

Convenient carton of six drills of one size keeps a sharp drill always handy. Drills lift as top opens.

If your supply house cannot supply you, write:

KENNAMETAL Inc., Latrobe, Pa.

Please send me FREE Kennametal Folder K-109 showing 26 different drill sizes, two different drill styles, and complete details on masonry drilling.

Name .....

Address .....

City ..... State .....

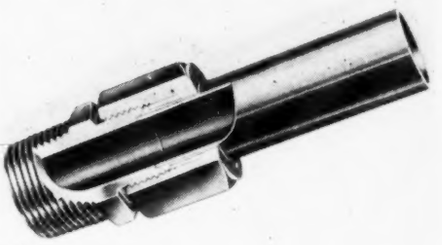
KENNAMETAL®

WORLD'S LARGEST MANUFACTURER OF CEMENTED CARBIDE DRILLING TOOLS

(Continued from page 114)

Afco Flareless Fitting

NAME—Afco flareless tube fitting.
PURPOSE—Tube fitting.
FEATURES—Gripping action of the fitting sleeve forms a positive leak-proof seal and makes the fitting



suitable for copper, steel, stainless steel, and aluminum tubing. Fitting is available in all standard shapes and sizes for tubing up to and including 1 inch O.D. Special combination shapes and sizes up to and including 2 inches can be supplied. All shapes, such as elbows, tees and crosses are machined from forgings. All other parts are machined from bar stock.
LITERATURE AVAILABLE—Catalog.
MADE BY — *The Aircraft Fitting Co., 1400 East 30th St., Cleveland 14, Ohio.*

Item 147

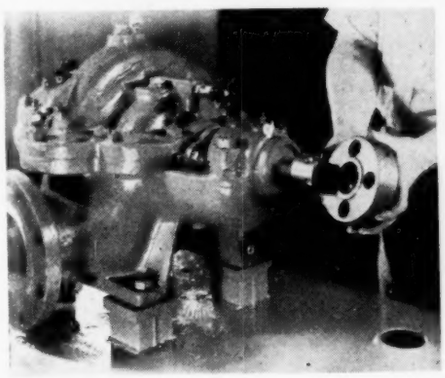
Electric Radiant Heat

NAME—Electric radiant panel heating.
PURPOSE—Panel heating using electric power as a heating source.
FEATURES—Panels are made from non-deteriorating, resin-bonded asbestos material in which nickel-chrome element wires are embedded and hermetically sealed so that elements cannot corrode or erode in use. System provides individual control of each room by an on-and-off switch and also by individual room thermostat. Available, under company's trade names, for a number of special applications. Medrae is designed for wall installation; Hirae for high level installation in factories, and auditoriums where there is a frequent air change; and Dulrae for normal ceiling installation in homes and apartments.
MADE BY—*General Radiant Heater Co., Inc., 101 Park Avenue, New York 17, N. Y.*

Item 148

Magic-Grip Coupling

NAME—Magic-Grip coupling.
PURPOSE — Coupling for use with pumps or motors.
FEATURES—Unit consists primarily of two cast iron discs with tapered



bores, rubber covered tubes assembled on studs, split tapered bushings and two set-screws for each disc. Four drilled recesses in the bushing accommodate the off and on positions of the set-screw driving holes of the coupling. Holes in the bushing are offset so that when set-screws contact them, a force is applied in a direction either to drive the tapers of the two pieces tighter or looser, depending upon whether the coupling is being taken off or whether the coupling is being put on.
SIZES AND CAPACITIES—Bore sizes of 5/8 and 2 1/8 in. for use up to 120 hp at 3,550 rpm.
MADE BY—*Allis-Chalmers Mfg. Co., Milwaukee, Wis.*

Item 149

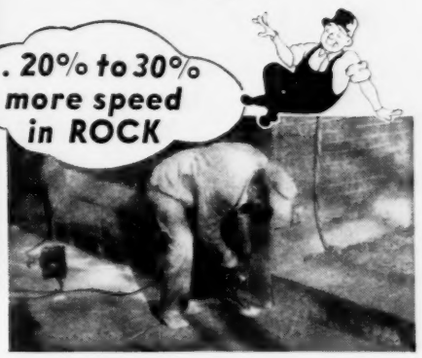
A-Lum-O Filter

NAME—A-Lum-O filter.
PURPOSE — An oilless permanent type of air filter for forced air heating systems.
FEATURES — Filter is made of aluminum wool fibers packed in an aluminized steel frame with cadmium-plated retaining mesh in a manner to provide graduated density of the fibers. These fibers are triangular in cross-section and have microscopic dust-catching barbs on all edges. Filters are made in all common sizes to fit any forced air heating system.
MADE BY — *Bard Manufacturing Co., Bryan, Ohio.*

Item 150

New!
Kennametal Tri-Point
Rock Drill

HAMMER DRILLS—
Granite, Hard Concrete, Sandstone, Hard Limestone
One of the greatest of all drill developments. Drills ANY nonmetallic. FAST and POWERFUL in rock.



Money Saved with ROCK Drills

Francis M. Neighly reports: "On foundations, granite slabs, and hard marble floors, Kennametal Tri-Point ROCK drills have saved me days of hard drilling and plenty on cost."

J. L. Purdy says: "We drilled 30 holes through a 5 inch slab of hard concrete in less than one hour."

New Kennametal Tri-Point ROCK drill hammers through the most abrasive sandstone, concrete aggregate, and HARD ROCK. Brute Strength enables it to take terrific poundings, shocks and impact.

Its wear-resistant Kennametal cutting edge stays sharp up to 100 times as long — gives up to 30% faster drilling speed. Diameters are 3/8" to 1"; lengths, 7 3/4" and 12". Buy money-saving Kennametal Tri-Point ROCK Drills at your supply house.

Use to: Anchor Machinery Install Conduits • Cut Stone • Install Parking Meters Fasten Signs, Doors.

Sets of one size in handy box of "pull-out" construction.

If your supply house cannot supply you, write:

KENNAMETAL Inc., Latrobe, Pa.
Please send me FREE Kennametal Folder K-111 showing how ROCK drilling is done at a saving of time and money and also complete particulars on the Kennametal Tri-Point ROCK drill.

Name.....
Address.....
City..... State.....

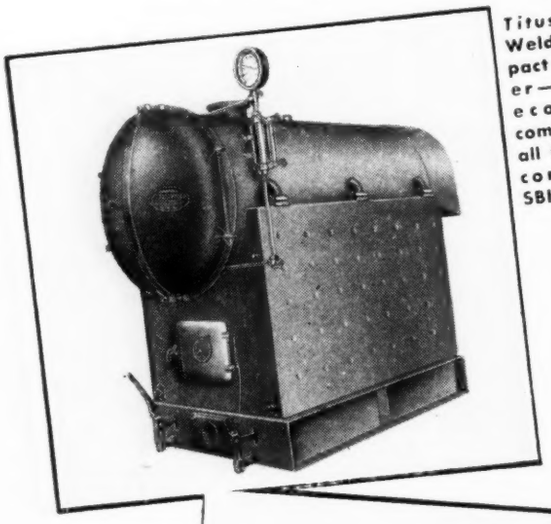
KENNAMETAL®
WORLD'S LARGEST MANUFACTURER OF CEMENTED CARBIDE DRILLING TOOLS

TITUSVILLE Builds

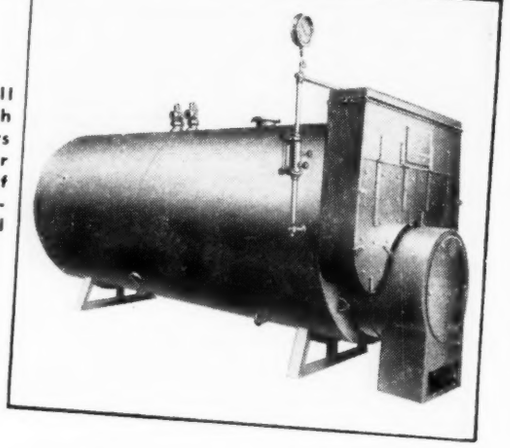
A COMPLETE LINE OF DEPENDABLE, ALL WELDED

HEATING BOILERS

IN SIZES AND RATINGS TO FIT EVERY REQUIREMENT



Titusville All Welded, Compact Steel Boiler—provides economical combustion for all fuels. ASME constructed, SBI rated.



Titusville All Welded Scotch Heating Boilers—available for all types of fuel. ASME constructed, SBI rated.

Since 1860 TITUSVILLE BOILERS have been the accepted standard of quality, dependability and economy. Get the TITUSVILLE facts before purchasing any new or replacement boiler.

Write today for new technical, informative bulletins

The TITUSVILLE IRON WORKS Co.

DIVISION OF STRUTHERS WELLS CORPORATION

TITUSVILLE, PENNSYLVANIA

Getting Personal

L. L. Garey

Lloyd L. Garey, (Heating, Ventilating and Air Conditioning of an Electric Generating Station, page 69) is a native of New Jersey and received his M.E. degree from Stevens Institute of Technology in 1924. Upon graduation he went with Public Service Electric and Gas Company and is still with that organization. After completing the Cadet Engineer's training course, seven years were spent in the Electric Generation Department, two in a generating station and five in the general office making engineering and economic studies relative to new additions to generating stations.

In 1936 he was transferred to the Mechanical Division of the Electric Engineering Department. Since that time, much of his work has been the designing and preparation of specifications for plumbing, heating, ventilation, air conditioning and elevator installations in the various office buildings, distribution headquarters, substations, and generating stations of the company. He is a licensed professional engineer in New York, a member of ASME, and has the title of senior engineer.

H. G. Bourne, Jr., (co-author, *An Orifice-Variable-Area Meter for Small Air Flow*, page 77) graduated in 1929 from the University of Maine with a Bachelor of Science degree in chemical engineering.

After 10 years experience in research and development of paper coatings with the Nashua Gummed and Coated Paper Co., he entered the field of public health engineering.

Abatement of stream pollution and the prevention of occupational diseases through engineering control of the environment have engaged his efforts since 1949, first with the United States Public Health Service and later in West Virginia.

At the present time he is in charge of the engineering activities of the Division of Industrial Hygiene, Ohio Department of Health and is a registered professional engineer in Ohio.

J. A. Wunderle

H. G. Bourne, Jr.

Jack A. Wunderle (co-author, *An Orifice-Variable-Area Meter for Small Air Flow*, page 77) graduated from Ohio State University in 1948 as a chemical engineer. A native of Ohio, he interrupted his college education during the war years to serve as a pilot-navigator with the 13th Air Force in the South Pacific campaign.

Following discharge from the service in 1945, he resumed his engineering studies at Ohio State University; also serving as an instructor in the engineering drawing department of that school. Since his graduation in 1948, he has been engaged in public health work as an industrial hygiene engineer with the Ohio Department of Health. He is a registered professional engineer in the state of Ohio.

LEE

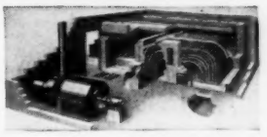
DIRECT WARM AIR HEATING

Higher Effi... ...Economy ...

Direct warm air heating is fundamentally the most efficient means of transferring heat from fuel to air, and is especially suited to the heating of industrial buildings of all types, hangars, etc. Lee Engineering Company was one of the pioneers in this field, and today offers a complete line of both central system heaters and unit heaters. The Lee system gives heat WHEN needed and WHERE needed. It begins to distribute heat immediately after fire is lighted and fan started, responds promptly without lag. Air-flow is counter-current to flow of combustion gases, so that air becomes warmer as it extracts heat from the progressively hotter gases. Lower installation cost than steam or hot water; requires no licensed attendant; provides ventilation without additional cost. No expensive installation or maintenance of pipes, traps, valves, and pumps. Used with oil or gas, also with coal (stoker or hand-fired). Four main types illustrated here—send for Bulletin 10 with complete facts.

BRICK-SET TUBULAR HEATER

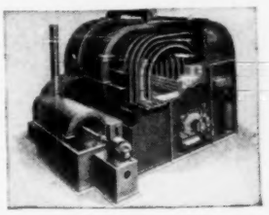
For use with central heating system (with duct distribution). Single heater capacities, 2,800,000 to 8,000,000 Btu per hour. Battery of two, operating as unit, provide over 10,000,000 Btu per hour.



Brick Set Tubular Heater

STEEL ENCASED TUBULAR HEATER

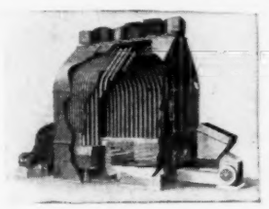
For use with central heating system (with duct distribution). Capacity range, 2,000,000 to 6,000,000 Btu per hour. May be installed in heated area without enclosure, requires no foundation. Unit may be moved by taking apart and reassembling.



Steel Encased Tubular Heater

TUBULAR UNIT HEATER

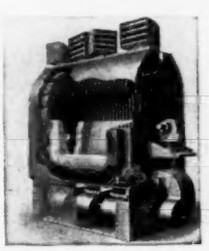
For use as central system (with duct distribution) or as unit heater, with adjustable outlet nozzles. Capacity range, 2,000,000 to 6,000,000 Btu per hour. In sizes up to 4,000,000 Btu, shipped completely assembled with all but mechanical equipment, refractory lining and controls in place. Requires no foundation. Equipped with crane hooks for moving.



Tubular Unit Heater

SHELL UNIT HEATER

For use with or without distributing duct system. Capacity range, 300,000 to 2,000,000 Btu per hour. Both hand- and stoker-fired models. All units shipped completely assembled, wired, ready for operation. Units furnished with either refractory lined or stainless steel combustion chambers. Heaters may be floor mounted or suspended in any position.



Shell Unit Heater

LEE ENGINEERING COMPANY

95 RIVER STREET • HOBOKEN, NEW JERSEY

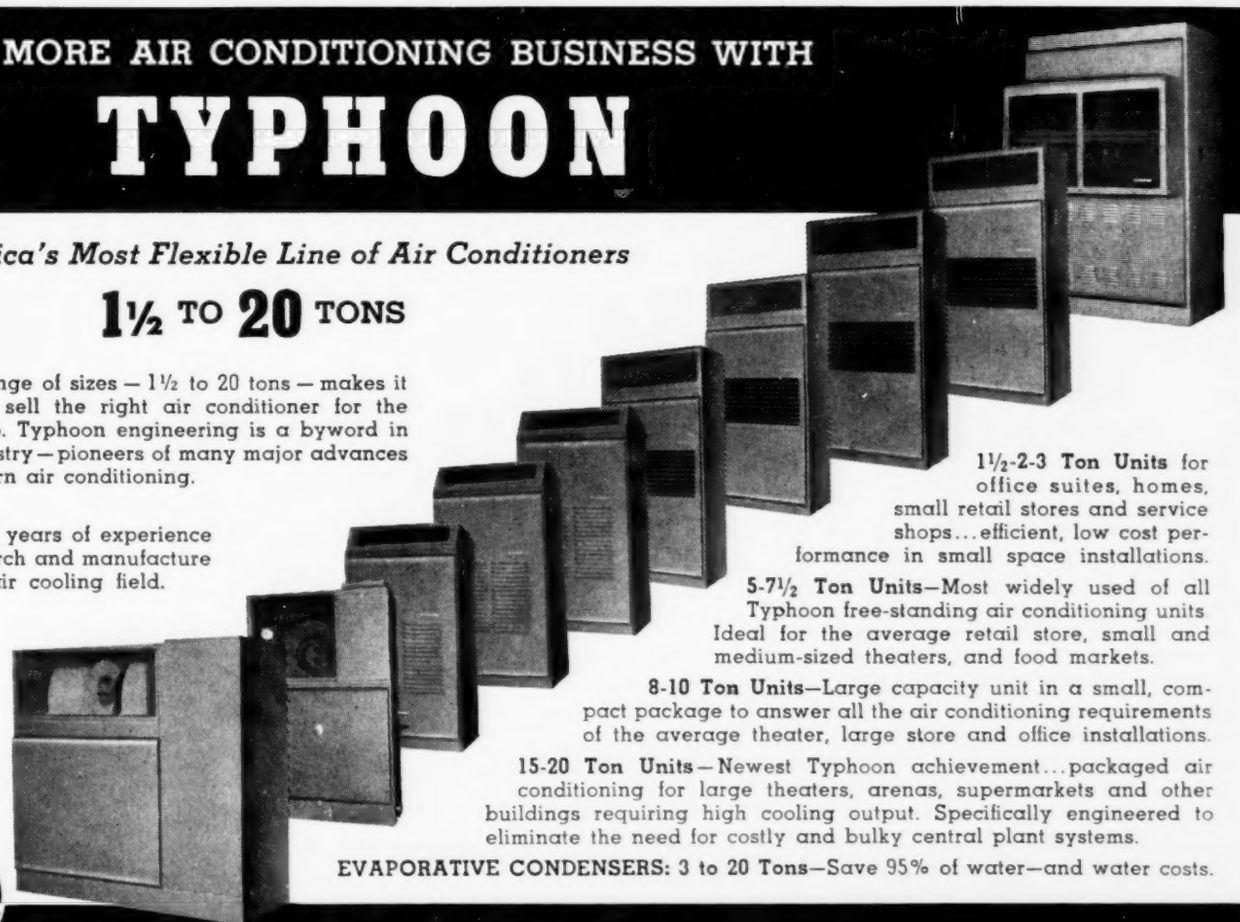
(Formerly Youngstown, Ohio)

GET MORE AIR CONDITIONING BUSINESS WITH

TYPHOON

America's Most Flexible Line of Air Conditioners

1½ TO 20 TONS



- Wide range of sizes — 1½ to 20 tons — makes it easy to sell the right air conditioner for the right job. Typhoon engineering is a byword in the industry — pioneers of many major advances in modern air conditioning.
- Over 40 years of experience in research and manufacture in the air cooling field.

1½-2-3 Ton Units for office suites, homes, small retail stores and service shops... efficient, low cost performance in small space installations.

5-7½ Ton Units—Most widely used of all Typhoon free-standing air conditioning units. Ideal for the average retail store, small and medium-sized theaters, and food markets.

8-10 Ton Units—Large capacity unit in a small, compact package to answer all the air conditioning requirements of the average theater, large store and office installations.

15-20 Ton Units—Newest Typhoon achievement... packaged air conditioning for large theaters, arenas, supermarkets and other buildings requiring high cooling output. Specifically engineered to eliminate the need for costly and bulky central plant systems.

EVAPORATIVE CONDENSERS: 3 to 20 Tons—Save 95% of water—and water costs.

TYPHOON AIR CONDITIONING CO., Inc. 794 UNION STREET, BROOKLYN, N. Y.

F. A. Thomas, Jr.

Frank A. Thomas, Jr., *(Canopy Exhaust Hoods,* page 83) attended Alabama Polytechnic Institute, Duke University and Purdue University; obtained B.S.M.E. from the latter in 1947. He was employed by the Georgia Department of Public Health as an industrial hygienist and obtained his M.S. in M.E. from Georgia Institute of Technology in 1949. He did research in exhaust ventilation under J. M. Dalla-Valle with assistance from the Georgia Department of Public Health, Division of Industrial Hygiene. The outgrowth of the research is the paper in question.

Since writing *Canopy Exhaust Hoods* he has become associated with the Atomic Energy Commission as an industrial hygienist.

. . . Since the Last Issue

New York Blower Co. has announced the appointment of **Gray Equipment Sales Co.,** 3219 Cheltenham Road, Toledo, Ohio, and, **Air Purification Co.,** 1863 Wazee St., Denver 2, Colo., as their representatives in those areas.

M. Russell Kambach has been named advertising manager for **Aluminum Company of America.** Mr. Kambach, who has been assistant advertising manager since March 1, 1949, will be succeeded in that position by **Jay M. Sharp** of the ALCOA advertising department.

Pelton W. Ellis has been named manager of the Refining Equipment Division of **Peabody Engineering Corp.,** New York, N. Y.

Election of two new officers in the **Iron Fireman Corp.,** a wholly owned subsidiary of Iron Fireman Manufacturing Co., has been announced. They are **C. T. Burg,** a former Portland resident, as president of the Iron Fireman Corp., and **E. C. Webb** of Cleveland as vice president. **Mr. Burg**

C. T. Burg

E. C. Webb

has been in charge of Iron Fireman sales since inception of that concern 27 years ago, while Mr. Webb has for many years been engineering service manager. Both men will continue to maintain offices at Cleveland.

Roger D. Spencer has been named assistant manager of "Twindow" sales for **Pittsburgh Plate Glass Co.** Mr. Spencer has been associated with Pittsburgh Plate Glass Co. since 1944 and with "Twindow" sales during the past three years. He joined the firm as a member of the Product Development Department.

THE RIGHT ALLOY
is the Right Answer to Many Piping Problems

Until recently, piping engineers were limited in their choice of piping materials to carbon steels, a few low alloy steels, wrought iron, cast iron and brass.

Today, thanks to metallurgical research and new welding techniques —many more materials are available, including intermediate and high alloy steels containing chromium, nickel, or both . . . commercially pure nickel . . . copper . . . aluminum . . . and alloys in which nickel, copper or aluminum is the major constituent.

Rapid corrosion of piping by the fluid handled, or contamination of the fluid by corrosion of the pipe—or by catalytic action of the pipe material with the fluid, are problems which today's piping engineer faces. Often, these problems are complicated by pressures and temperatures at which the fluid must be conveyed, or by wide fluctuations of pressures and temperatures when the process is cyclic in nature.

Each of these service conditions demands utmost care in the selection of the piping material.

Tube Turns, Inc. is constantly studying all of the factors involved in the application of alloy materials to piping systems. Today the ever-expanding line of Tube-Turn Welding Fittings includes more than 40 different alloys in both ferrous and non-ferrous classes . . . to help solve *your* piping problems.

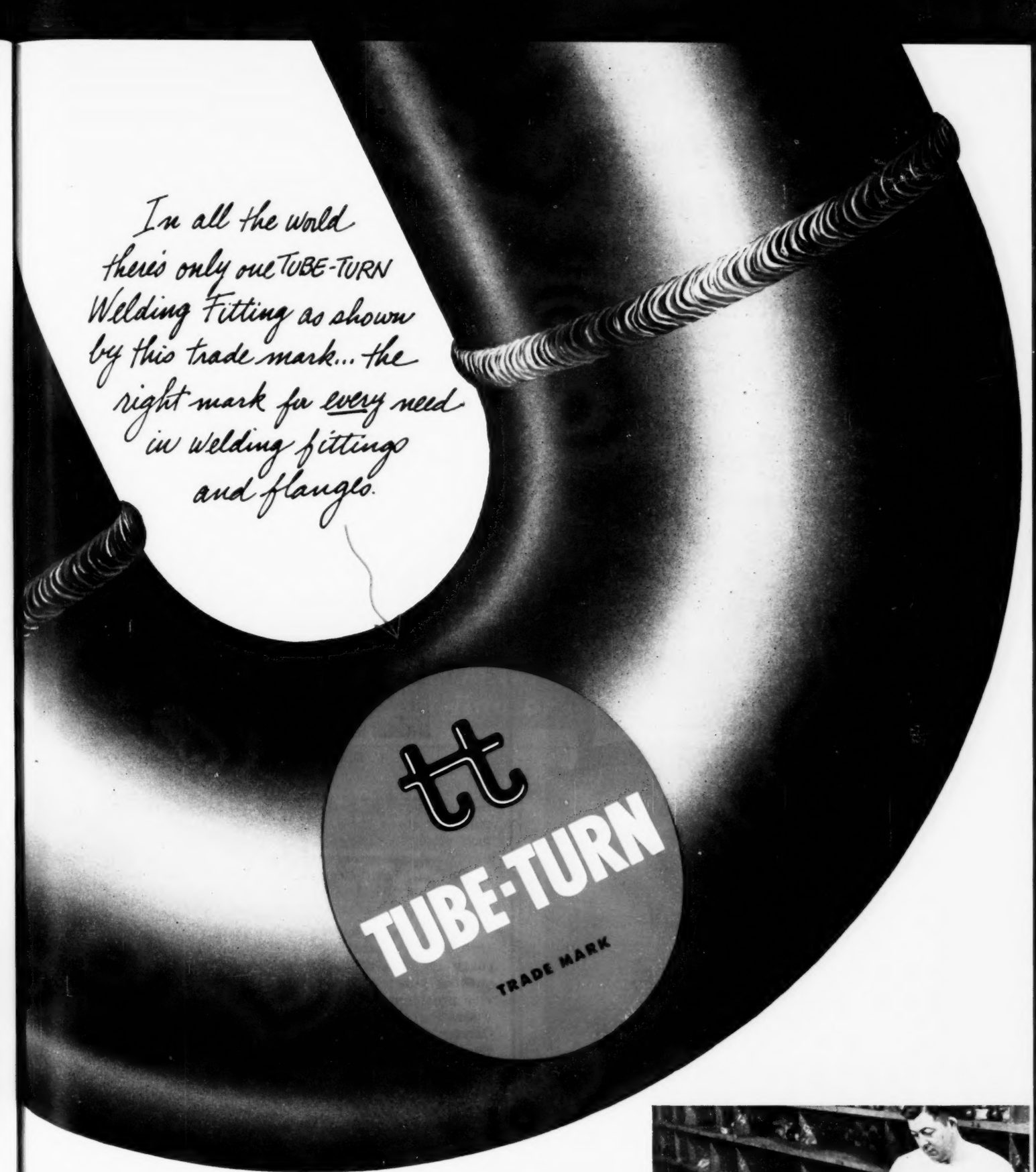
FREE BULLETIN

Write today for your free copy of "Special Alloys", a bulletin containing valuable information of Stainless Steels, Nickel and Nickel Base Alloys, Copper and Copper Base Alloys, and Aluminum and Aluminum Base Alloys. Discusses physical characteristics, service conditions and gives chart of sizes and wall thicknesses available.

"Be Sure You See The Double tt"

TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

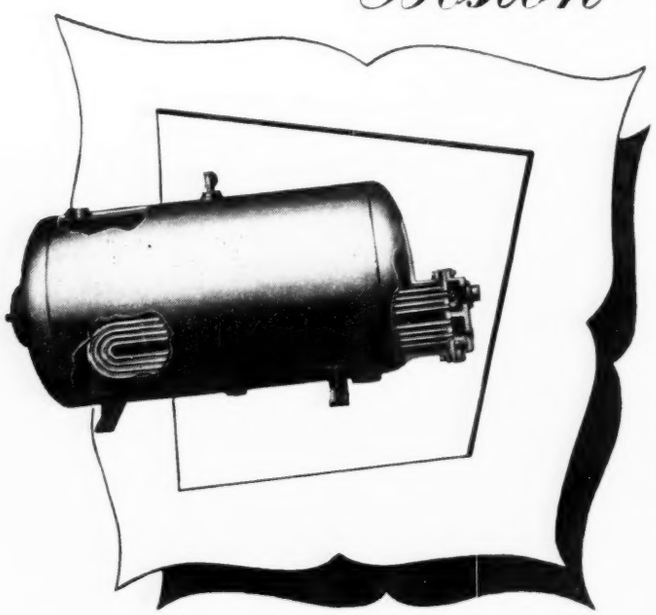


Your nearby TUBE TURNS distributor can serve you right from stock. Call him for prompt delivery.

TUBE TURNS, INC., LOUISVILLE 1, KENTUCKY DISTRIBUTORS IN ALL PRINCIPAL CITIES

DISTRICT OFFICES: NEW YORK • PHILADELPHIA • PITTSBURGH • CHICAGO • HOUSTON • TULSA • SAN FRANCISCO • LOS ANGELES

Patterson "copper-lined" hot water storage heaters supply well known activities in metropolitan *Boston*



NEW ENGLAND MEDICAL CENTER
LYING-IN HOSPITAL
CHRISTIAN SCIENCE PUBLISHING CO.
MASS. INST. OF TECHNOLOGY
U. S. NAVY YARD
BELMONT HIGH SCHOOL
TUFTS COLLEGE
DEACONESS HOSPITAL

In one of the above installations—Belmont High School—the Patterson Copper-Lined Storage Heater has been in service for well over 20 years. In fact, in and around Boston there are many Patterson Copper-Lined Heaters still going strong although installed from 20 to 40 years ago... a record which indicates that copper-lined heaters are *durable* as well as non rusting and that Patterson-Kelley personnel has the experience and skill with which to properly make copper-lined heaters.

We suggest you consider "copper-lined" for the next "water storage heater" jobs you have coming up.

the **Patterson-Kelley Co., Inc.**

97 Burson Street • East Stroudsburg, Pa.

offices or representatives in principal cities

W. C. Newberg, president, **Airtemp Division of Chrysler,** has announced the appointment of **Carl E. Buchholzer** and **W. E. Mack** to his staff. Mr. Buchholzer was named assistant to the president, while Mr. Mack will handle special assignments for Mr. Newberg. Mr. Buchholzer has been with Airtemp since the organization first moved to Dayton Mr. Mack, a native of Detroit, has been with Chrysler Corporation since 1935.

S. H. Kibbe

Elevation of three long-time Iron Fireman men to newly created sales positions has been announced by **Iron Fireman Corp.** They are: **Howard M. Cutshaw** of Cleveland, from assistant sales manager to domestic division sales manager; **Stewart H. Kibbe** of Minneapolis, from division engineer to industrial division sales manager; and **C. D. Carter** of Cleveland, from central division sales manager to assistant sales manager in charge of organization development. Iron Fireman in 1928 as a district representative with Mr. Cutshaw joined

C. D. Carter

H. M. Cutshaw

headquarters at Portland and has been assistant sales manager since 1945. Mr. Kibbe has been with Iron Fireman since 1934 when he started in the product and engineering development department at Portland. Mr. Carter started with Iron Fireman even before he finished studying at Oregon State College in 1927.

At the twenty-fourth annual meeting of the **Industrial Unit Heater Association** held in New York, N. Y., on February 16, 1950, the following officers were elected for the ensuing year: **J. C. Patterson,** president; **H. S. Wheller,** vice president; and **L. O. Monroe,** secretary-treasurer.

Mr. Patterson is director of sales, Industrial Heating, Carrier Corp., and Mr. Wheller is president of the L. J. Wing Manufacturing Co.

J. C. Matchett

At the annual meeting of the board of directors of **Illinois Engineering Co.,** Chicago, **James C. Matchett** was elected president and treasurer; **Gordon L. Harris,** vice president and assistant treasurer; and **L. B. Carlson,** secretary. **Robert L. Gifford,** who has served as president and treasurer of the company since its incorporation in 1900, is now chairman of the board. Mr. Matchett, a member of ASHVE and ASME, joined the company in 1912. He has served as vice president and general manager since 1923. Mr. Harris, identified with the company since 1910, has been secretary since 1923.

Henry F. Hebley, director of research for Pittsburgh Coal Company since 1939, has been appointed research consultant to the **Pittsburgh Consolidation Coal Co.**

Here's the RIGHT FORMULA for choosing STEAM TRAPS

Be sure you use the right formula in figuring its cost when you choose a steam trap. *Purchase price alone never gives a true cost picture.* Figure the installed cost (adding installation and maintenance costs) and you've an honest picture of steam trap costs.

Super-Silvertop Steam Traps always assure lower ultimate cost. The conventional trap requires costly fitting and labor to get it installed, while Super-Silvertops fit snugly as a pipe union or elbow . . . saving up to nine fittings plus sixty minutes of installation time. In addition, Super-Silvertops save forty-five minutes whenever you replace a part or clean. Use the right formula in figuring trap costs, and you'll choose Super-Silvertops every time. Write for free copy of "Solving Steam Trap Problems" which gives further information on cutting steam trap costs.

RIGHT FORMULA

X=PURCHASE PRICE OF TRAP
Y=COST OF INSTALLING TRAP
Z=COST OF MAINTAINING TRAP
X+Y+Z=TOTAL EXPENSE

THE V. D. ANDERSON COMPANY • 1992 West 96th Street • Cleveland 2, Ohio

SUPER-SILVERTOPS
SAVE YOU MONEY
straight-in-line or as an elbow

GAS HEATING EXPERTS SELECT . . .

HYDROTHERM

FOR RADIANT & CONVECTOR SYSTEMS.

MODEL 2HW3
Capacity: 72,000 BTU Input
Size: 13"x26"x26"
Weight: 250 lbs.

Exclusive Cast-Iron Design Assures Maximum Performance at Lowest Cost in Minimum Space

AGA Approved for All Gases
100 lbs. A.S.M.E. Rating

Write For HYDRO THERM Bulletin HV
Immediate Delivery

HOOK & ACKERMAN, Inc.
18 East 41st Street, New York 17, N. Y.

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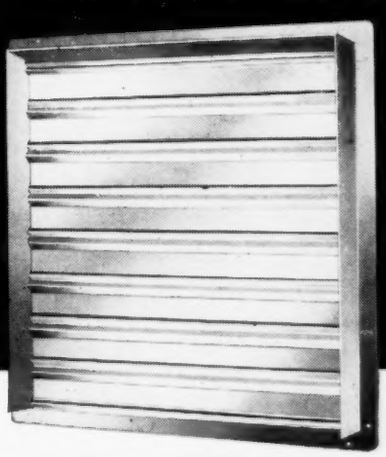
they all want **AIR-FLO**



MODEL A-555

THE AUTOMATIC SHUTTER WITH ALL THE FEATURES

Front View—Closed

IT TAKES THE LOAD OFF THE FAN!

Aluminum louvers open fully, permitting capacity fan operation. New heavy reinforcement strip adds strength and long life to the louvers, assures quiet operation and perfect counterbalance, prevents rattling. Deep shroud protects shutter from high winds. Tie-rod, brackets and bearings inside frame, not exposed to weather. Special finish resists corrosion. Many other features.

Write for New Air-Flo Catalog 43-F

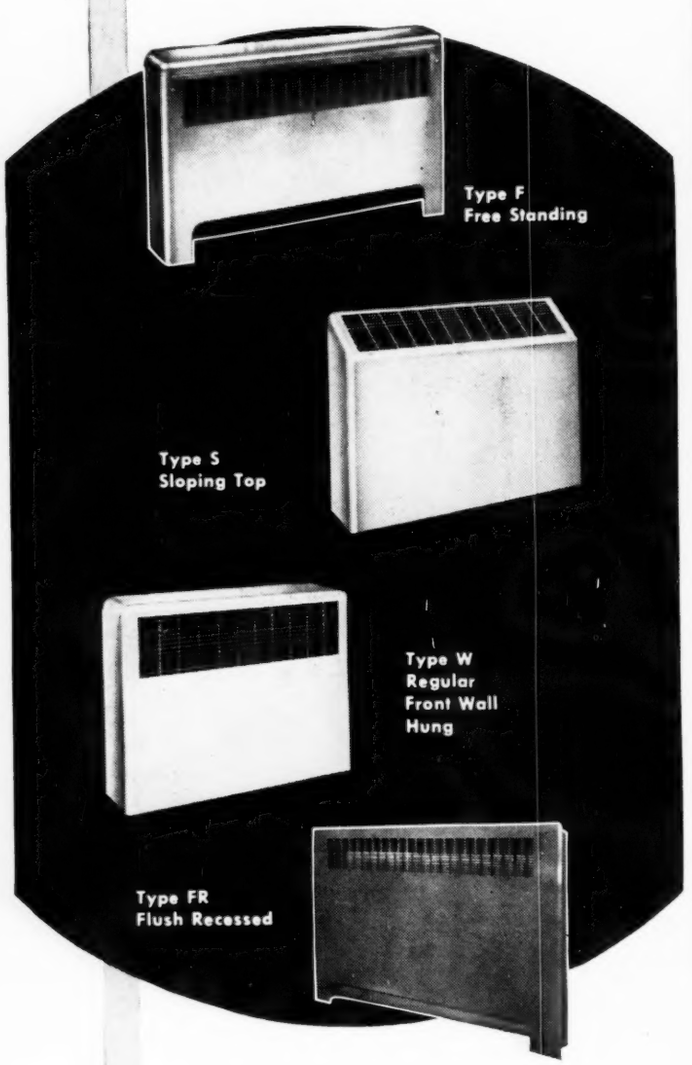
Illustrations and details of the complete Air-Flo line.

AIR CONDITIONING PRODUCTS CO.
2340 W. LAFAYETTE BLVD. • DETROIT 16, MICH.

Attractively Designed

AIRTHERM CONVECTORS

Quick...Easy to Install



Attractive design and outstanding performance have resulted in an increasing preference for Airtherm Convectors in institutions, apartments, homes and schools. Quick, easy installation plus increased customer satisfaction enables you to make more money on each job with Airtherm Convectors.

Try them — on your next job.
Write for Bulletin No. 701.

AIRTHERM MANUFACTURING COMPANY
722 South Spring Avenue • St. Louis 10, Missouri

-96

Two additional electrical division sales offices, one in New Orleans and one in Davenport, have been established by **Wagner Electric Corp.** of St. Louis, bringing the total number of offices maintained in the United States to thirty. **G. W. Morris** of the Wagner Omaha sales office retired January 31st after twenty-two years with the company. **G. D Jackson** succeeds him as the electrical division representative at Omaha.

Edward F. Ford has been appointed manager of marketing and promotion, also divisional sales manager, for the **C. A. Dunham Co.**, Chicago. For the past two years Mr. Ford has been assistant sales manager for Dunham, manufacturer of heating equipment and engineered heating systems. He was formerly vice president and sales director for Mechanical Home Systems, Inc., and was sales manager for Kehm Corp. Mr. Ford will be aided by **E. W. Cardiff**, newly appointed assistant manager of marketing and promotion.

E. F. Ford

J. W. Powers

The appointment of **Jos. W. Powers** as general sales manager of the **Powers Regulator Co.** of Chicago has been announced. Mr. Powers is vice president in charge of the central division and has served the company in a sales capacity for over 20 years.

James W. Elizardi has recently been made manager of the Houston sales Office of **The Marley Co., Inc.** Mr. Elizardi, who is a graduate of Tulane University, previously worked for Griscom-Russell and the Illinois Central Railroad.

L. J. Wing Mfg. Co., manufacturers of heating, ventilating, and combustion equipment and steam turbines, with three separate factories in Newark, N. J., and with general offices in New York City, has consolidated all of these in a single modern factory building at Linden, N. J., with additional facilities, including extra land for future growth. The new address is Vreeland Mills Road, Linden, N. J. An office at 154 W. 14th St., New York 11, N. Y., will be maintained to handle New York City sales.

Perfex Corp., Milwaukee, manufacturers of automatic temperature controls and industrial engine radiators, announce the election of **Arthur J. Brennan**, works manager, to the position of vice president.

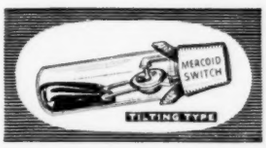
The third generation Morse became president of **Fairbanks, Morse & Co.** on March 22, 1950. **Robert H. Morse, Jr.**, who started with the company in 1916 in the foundry of the Beloit, Wis., plant, has been vice president in charge of operations. Previously he was vice president in charge of sales, assistant general sales manager and has held many other positions. His father, Colonel Robert H. Morse, whom he succeeded, becomes chairman of the board. Colonel Morse has been president since 1931 and has spent 55 years with the company.

Walter S. Browning, assistant sales manager for the past two years, has been appointed sales manager of the **C. A. Dunham Co.** Mr. Browning was western division sales manager of the Parker Appliance Co., Cleveland, Ohio, for seven years. He has also been with National Cash Register Co., and with the A&P Food Chain as a sales supervisor.

MERCOID

AUTOMATIC CONTROLS FOR HEATING, AIR CONDITIONING, REFRIGERATION AND VARIOUS INDUSTRIAL APPLICATIONS

THE ONLY 100% MERCURY SWITCH EQUIPPED CONTROLS



The distinguishing feature of Mercoid Controls is the exclusive use of Mercoid hermetically sealed mercury switches. These switches are not subject to dust, dirt or corrosion, thereby assuring better performance and longer control life. The items shown below are but a few miscellaneous items. See Catalog No. 700 for the complete line.

Pressure Controls

Temperature Controls

Float Operated Controls

Transformer-Relays

Low Voltage Thermostats

Line Voltage Thermostats

Liquid Level Control

Oil Burner Safety and Ignition Controls

If you have a problem involving the automatic control of pressure, temperature, liquid level, mechanical operations, etc., it will pay you to consult Mercoid's engineering staff — always at your service.

Manufacturers of Dependable Automatic Controls for Over A Quarter of A Century

THE MERCOID CORPORATION · 4223 BELMONT AVE. CHICAGO 41 · ILL.

D.I.P. Solves UNDERGROUND & EXPOSED PIPING PROBLEMS

REG. U. S. PAT. OFF.

When architects and contractors have difficult insulating problems in the conveyance of steam, hot water, or refrigerants, they most often find the answer in DURANT INSULATED PIPE.

Because the positive protection is always dependable and the non-porous asphalt is completely waterproof, D. I. P. will not lose efficiency with the passage of time. This long service dependability with its low maintenance costs adds to the over-all economy of DURANT installations.

If you do not have complete catalog information and engineering data on DURANT products and processes, we will send them on request — or you can secure them through our representatives located in principal cities over the entire country.

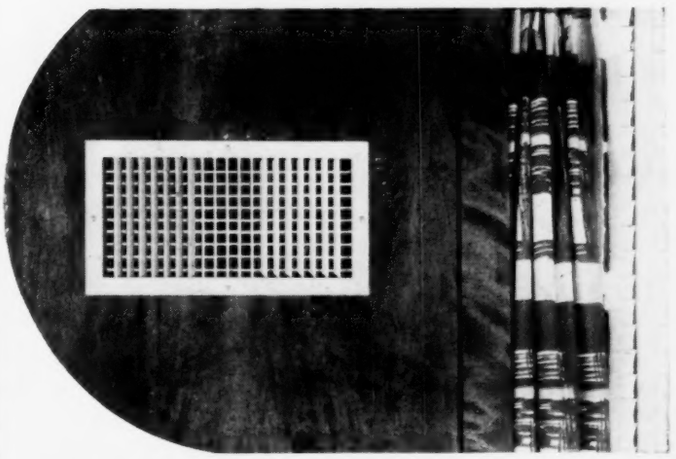
PRE SEALED

REG. U. S. PAT. OFF.

DURANT INSULATED PIPE COMPANY
1015 Runnymede St. East Palo Alto, California

"AUER Streamliner"

REGISTERS and GRILLES — for high velocity outlets

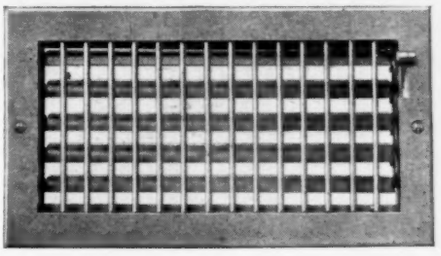


Streamliner wall registers and grilles afford a wide range of multiple deflection for air conditioning, ventilating, or cooling systems. They provide correct diffusion for high velocity outlets.

Bars are hollow moulded, beveled, perfectly formed, and smooth in contour. They are pivoted in the frame on special split sleeves, or expansion inserts, which furnish proper tension to hold bars firmly when set, yet allow easy adjustment to the desired angle with one simple tool. Bars are shaped like an airplane wing in cross-section, and pivoted at the exact center, so they can be turned completely around. Some users prefer to turn the thin edge outward for outlets (and the broader edge toward the flow of air) cutting resistance and turbulence to a minimum. Bars may be set at any angle, in any grouping. Shutters of multi-louvre valves are pivoted on rivets to prevent vibration. All Streamliner registers are equipped with gaskets. Write for Folder S-49 with sizes and list prices.

8 MODELS

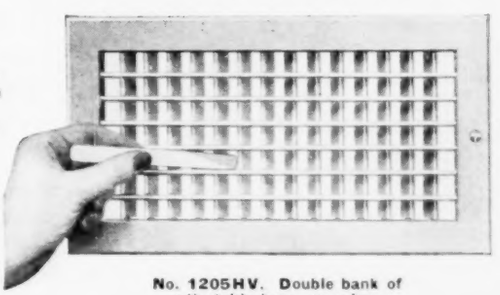
The Series includes models with single bank of adjustable bars (vertical or horizontal), also with double bank of adjustable bars (vertical in front and horizontal in back, or the reverse), also all above four types with the addition of horizontal multi-louvre valves in the rear, controlled by lever on face of register.



No. 1005V-HML. Single bank of adjustable bars, with multi-louvre valve.

Cross Section of Blade

Complete Auer Register Book —or Catalog "G" on perforated grilles— sent on request.



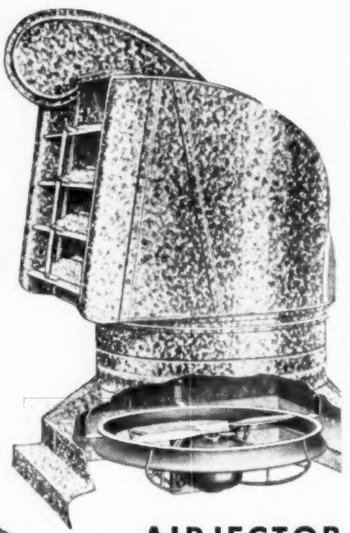
No. 1205HV. Double bank of adjustable bars, no valve.

THE AUER REGISTER CO., 3608 Payne Avenue, CLEVELAND 14, OHIO

Auer REGISTERS & GRILLES for AIR CONDITIONING & GRAVITY

Triple Threat to Bad Air!

When you need *power* roof ventilation —*specify or recommend* SWARTWOUT Equipment

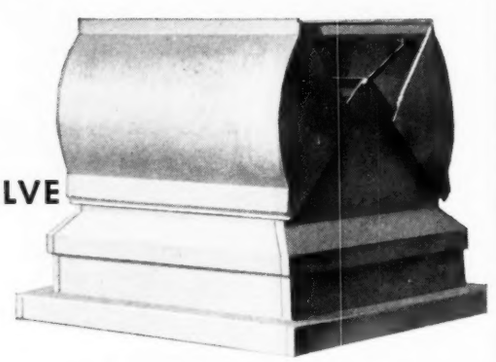


AIRJECTOR

VALVENT

● Concentrated heat, smoke or fume conditions often yield only to *power* ventilation. Airjector, Valvent and Ject-O-Valve Ventilators help you to profit by Swartwout's 45 years experience in this field.

JECT-O-VALVE



● We help you select the most economical unit for efficient use in a given situation. State your problem—write for Bulletin 338H.

18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Industrial Ventilation Specialists Since 1904

Equipment for *Controlled* Air Circulation

James E. Sargeant has been appointed sales manager for the Heating Division of the **Richmond Radiator Co.** Mr. Sargeant, a graduate of the University of Virginia, joined Richmond in March, 1947. Prior to this he distributed and so'd building and heating material in the southeastern United States. Mr. Sargeant served from 1941 to 1947 in the U. S. Navy and in 1940 was connected with the Washington sales office of Reynolds Metals Co.

Purchase of the **Semler Co.**, Jeannette, Pa., manufacturer of cast iron pipe fittings, has been announced by Charles F. Kennedy, president of the **Kennedy Valve Mfg. Co.**, Elmira, New York.

INDUSTRIAL DEGREE-DAYS
February, 1950

City	55F Base	45F Base
Baltimore, Md.	485	206
Buffalo, N. Y.	837	557
Chicago, Ill.	732	452
Cleveland, Ohio	716	440
Detroit, Mich.	790	510
Indianapolis, Ind.	647	367
New York, N. Y.	613	333
Philadelphia, Pa.	569	289
Pittsburgh, Pa.	578	301
St. Louis, Mo.	491	216

Canadian Degree-Days for February, 1950*

City	February		Cumulative Sept. 1 to Feb. 28	
	1950	Normal	1949-50	Normal
Calgary, Alta.	1255	1355	7401	6666
Charlottetown, P. E. I.	1467	1338	5544	5666
Crescent Valley, B. C.	1050	1112	6063	5743
Edmonton, Alta.	1560	1501	8132	7299
Fort William, Ont.	1574	1582	7445	7204
Grande Prairie, Alta.	1658	1456	8476	7456
Halifax, N. S.	1223	1170	4622	5068
London, Ont.	1221	1240	4969	5253
Medicine Hat, Alta.	1260	1406	7211	6438
Moncton, N. B.	1462	1392	5744	6106
Montreal, P. Q.	1488	1460	5725	6108
North Bay, Ont.	1543	1492	6640	6653
Ottawa, Ont.	1495	1459	6016	6382
Penticton, B. C.	958	969	5499	4779
Porquis Junction, Ont.	1767	1764	7916	8064
Prince George, B. C.	1154	1305	7576	6677
Quebec City, P. Q.	1501	1481	6115	6688
Regina, Sask.	1708	1764	8519	8137
St. John, N. B.	1336	1266	5243	5652
Saskatoon, Sask.	1714	1635	8800	7911
Toronto, Ont.	1150	1206	4567	5154
Vancouver, B. C.	740	736	4278	3797
Victoria, B. C.	683	689	3848	3414
Windsor, Ont.	1109	1148	4403	4877
Winnipeg, Man.	1792	1775	8320	8091

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.
The Department reports a slight revision in the figures for January as published in last month's issue. Corrected figures are: Crescent Valley, B. C., 1851; Quebec City, P. Q., 1497.

for • SPRAYING
• WASHING
• RINSING
• COOLING
• AIR CONDITIONING

YARWAY

SPRAY NOZZLES

FAN-TYPE FOR FLAT SLICING SPRAY

Get the most out of your Spraying Equipment with minimum power . . . with efficient spraying.

Use Yarway Nozzles. No internal vanes or other restrictions to clog or hinder flow. Two types—Yarway Involute-type producing a fine hollow spray with minimum energy loss, and Yarway Fan-type producing a flat fan-shaped spray with time-saving slicing action for cleaning.

Wide range of standard sizes and capacities. Cast or machined from solid bar stock.

Thousands in use. - - Write for Bulletin N-616.

YARNALL-WARING COMPANY
104 Mermaid Avenue Philadelphia 18, Pa.

Capable of handling either LOW or HIGH VELOCITIES*

RESEARCH with resultant performance data has developed and proved a line of new Multi-Velocity Air Filters . . . super-efficient air filters capable of handling either LOW or HIGH Velocities . . . in a single unit!

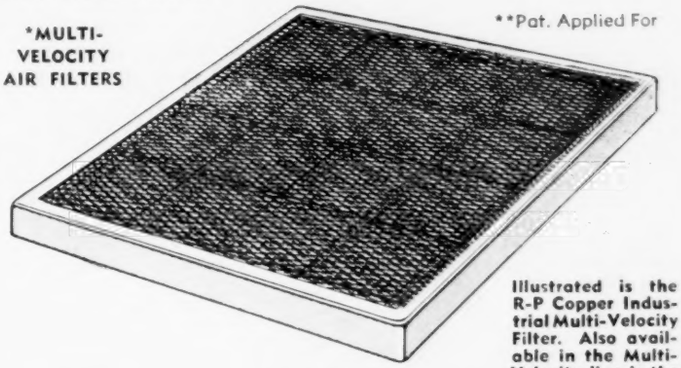
Features include . . . increased efficiency at all air velocities up to 550 feet per minute . . . lower restriction at all air velocities . . . increased depth loading . . . highest dirt holding capacity . . . exclusive non-clogging design . . . improved cleanability . . . PLUS . . .

Double Filtration.** The baffle pattern of the filter reduces in size of apertures through the first half of the filter . . . then starts anew with larger apertures and reduces again . . . A DOUBLE FILTRATION PROCESS!

Ask your distributor about this great line of R-P air filters. If you have not received your copy of our new portfolio, R-P MULTI-VELOCITY AIR FILTERS, write today! Address Research Products Corp., Madison 10, Wis., Dept. V. Canadian Representative—Delhi Industries, Delhi, Ontario.

*MULTI-VELOCITY AIR FILTERS

**Pat. Applied For



Illustrated is the R-P Copper Industrial Multi-Velocity Filter. Also available in the Multi-Velocity line is the R-P Heavy Duty Industrial, R-P Alumaloy Industrial and R-P Alumaloy Grease Filter.

RP . . . PRODUCTS OF RESEARCH

WASHABLE AND REPLACEMENT AIR FILTERS • GREASE FILTERS • EVAPORATIVE COOLER MATERIALS

Important Data on the latest
Ornamental Grilles, Louvers, Enclosures, Etc.

More than sixty-five years of grille designing and perforating experience is represented by the large selection of patterns shown in this new catalog and handbook. Herein will be found the ultimate in lasting ornamental and functional grille beauty.

H & K Grilles are produced by master craftsmen. The holes are clean cut and free from burrs — surfaces will be found to be flat and smooth — the symmetry and alignment of margins are accurate.

Materials used include only choice materials in stainless steel, brass, bronze, aluminum, etc. Grille shapes may be rectangular, square, round or odd and may be formed to suit your specifications.

Write
FOR YOUR COPY
OF H & K GRILLE
Catalog No. 33

The Harrington & King Perforating Co.
5664 FILLMORE ST., CHICAGO 44, ILLINOIS
114 LIBERTY STREET, NEW YORK 6, N. Y.

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SHALLO-WELL
OIL-FIRED FLOOR FURNACES
ONLY 34 INCHES DEEP
BTU CAPACITIES OF
★ 50,000 ★ 65,000 ★ 75,000
Write for Details!
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EFFICIENT, LOW COST AIR REMOVER
Muckle VENTS
POWER DRIVEN ROOF EXHAUSTER

For stores, cafes, bakeries, laundries, garages, etc. Built to function in wet air—motor is out of line of air flow. A compact, sturdy, easy-to-install package unit. Sizes 370 to 13,080 C.F.M. air delivery. Fits any roof. *Write us about YOUR problem.*

MUCKLE MANUFACTURING CO. • OWATONNA 3, MINN.

NEWS BRIEFS *(Concluded from Page 102)*

• At the end of December, 1949, the Public Health Service had approved initially a total of 1,019 projects under Title VI of the Public Health Service Act authorizing assistance to states in hospital construction. These projects will provide nearly 50,000 additional hospital beds, and numerous supporting hospital services, such as power plants and nurses' quarters. They also provide 177 public health centers. The estimated total cost of these projects is $668 million, of which the Federal share will be $210 million. Projects have been approved in every state and territory. A total of 139 projects are completed and in operation, representing an estimated cost of $35 million, while 423 other projects are under construction at an estimated total cost of $385 million. The total of Federal payments made, as of December 31, 1949, is $30.1 million. A year-end report lists the projects and their stages of completion.

• A mid-winter building record was assured by a less-than-seasonal decline in construction activity during February, the Construction Division of U. S. Department of Commerce and the U. S. Department of Labor's Bureau of Labor Statistics reported. The total value of new construction put in place during February amounted to over $1.4 billion, off 5% from January, but 21% more than the total for February last year. In terms of physical volume, as well as in dollars spent, the amount of new construction put in place during the past four months has surpassed all previous records of mid-winter construction volume, including war construction in the winter of 1941-42.

COMFORT CONFERENCES

on warm air heating show gain in attendance.

The 1950 schedule of Indoor Comfort Conferences sponsored by the National Warm Air Heating and Air Conditioning Association gives every evidence of establishing the highest average attendance per conference in the 3½ years during which this national dealer education program has been conducted. With ten conferences of the current schedule having been completed by the end of February, when this report was issued, the average attendance figure stood at 107.3.

Instruction is under the direction of Guy A. Voorhees, technical secretary of the association.

The 1950 conferences are centered around the design and installation of warm air heating systems for the small, low-cost home as well as for large non-residential type installations. Featured among the low-cost home systems is instruction on the design of the perimeter radiant-convection system for homes built on concrete slab-on-ground floors. Non-residential installations dealt with in the current conference series are those which serve churches, garages, bowling alleys, stores, etc.

Conferences scheduled for April will be in Atlanta, Chicago, South Bend, Fort Wayne, and Detroit.

GET

Lowest Power Costs!!

INSIST ON

TODD BURNERS

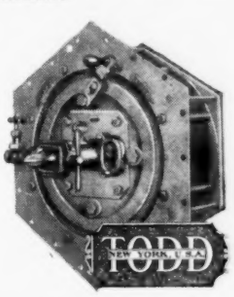
-GAS OR OIL

Whether you burn gas, oil or a combination, you'll be amazed how Todd Burners cut your fuel and maintenance costs . . . give you savings up to 10%, increased power capacity. For utmost economy in your boiler plant—let skilled Todd specialists, backed by 35 years of Todd experience, engineer your replacement of obsolete equipment or new installations.

Oil Burners

Gas Burners

Combination Oil and Gas Burners



COMBUSTION EQUIPMENT DIVISION

TODD SHIPYARDS CORPORATION

81-16 45th Ave., Elmhurst, Queens, N. Y.

See the Classified Telephone Book

NEW YORK • BROOKLYN • ROCHESTER
BUFFALO • HOBOKEN • NEWARK
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GRAND RAPIDS • TAMPA • GALVESTON
SAN ANTONIO • DALLAS • HOUSTON
TULSA • MOBILE • NEW ORLEANS
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SEATTLE • MONTREAL • TORONTO
BARRANQUILLA • BUENOS AIRES • LONDON

THERMOBLOC

THE MOST *Adaptable*

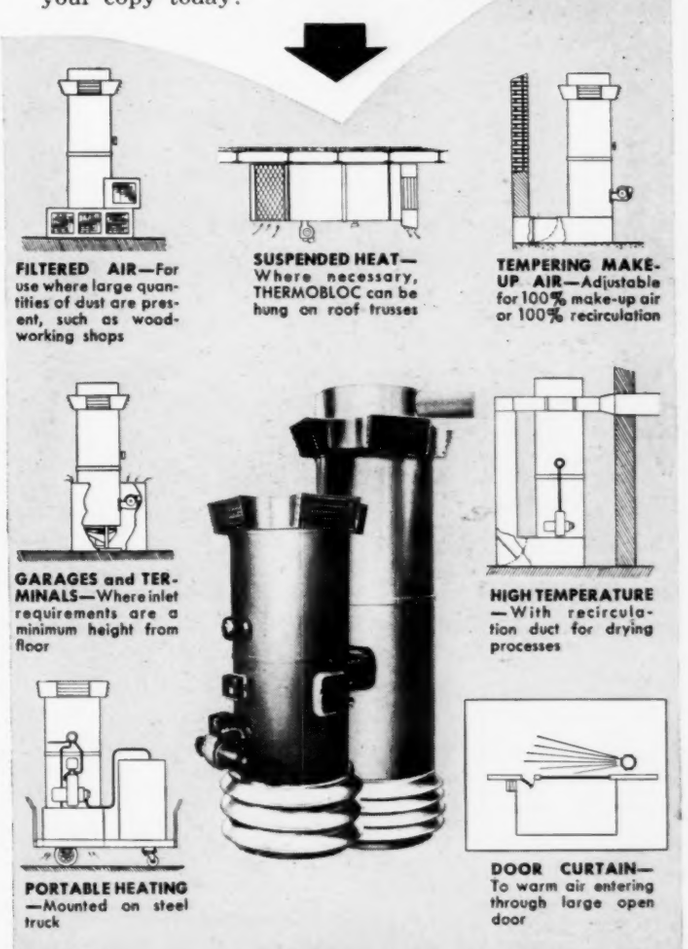
SELF-CONTAINED • DIRECT-FIRED

HEATER ON THE MARKET!

All the essentials of a heat producing system are contained in THERMOBLOC'S smartly styled casing when it is shipped from the factory. THERMOBLOC requires no assembly, occupies the smallest floor area per btu, and its "straight-through" design provides flexibility of applications not possible with other types of heating devices.

A few of the variety of uses to which THERMOBLOC has been put are shown here. Variations of one of these might just answer *your problem.*

THERMOBLOCS are offered in two standard sizes: Model 300, 30 inches in diameter and 7 feet high, delivers 300,000 btu's at 3000 C.F.M. Model 550, 30 inches in diameter and 10 feet high, delivers 550,000 btu's at 4800 C.F.M. Prat-Daniel Corporation, designers and manufacturers of THERMOBLOC, offer a new bulletin giving complete engineering data to aid you in estimating your heating requirements. Write for your copy today!


FILTERED AIR—For use where large quantities of dust are present, such as woodworking shops
SUSPENDED HEAT—Where necessary, THERMOBLOC can be hung on roof trusses
TEMPERING MAKE-UP AIR—Adjustable for 100% make-up air or 100% recirculation
GARAGES and TERMINALS—Where inlet requirements are a minimum height from floor
HIGH TEMPERATURE—With recirculation duct for drying processes
PORTABLE HEATING—Mounted on steel truck
DOOR CURTAIN—To warm air entering through large open door

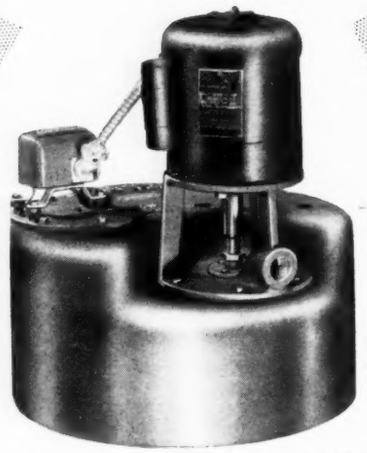
THERMOBLOC DIVISION

PRAT-DANIEL CORPORATION

Manufacturers of Prat-Daniel Power Equipment

86-4 WATER ST. E. PORT CHESTER, CONN.

Pump Points
—that mean PERFORMANCE



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. . . WHERE SPACE IS LIMITED!

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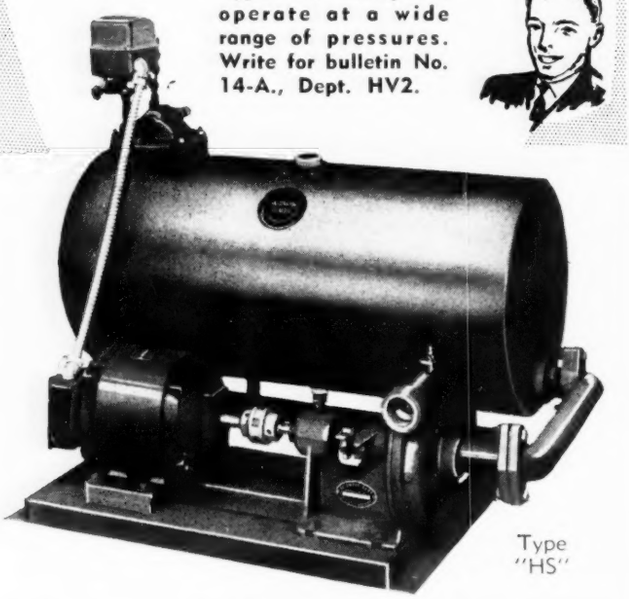

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COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

HYGIENE CONFERENCE—Joint conference of four groups, including American Industrial Hygiene Association, at the Hotel Sherman, Chicago, Ill. Dr. Henry Smythe, Jr., Industrial Hygience Foundation, 4400 Fifth Ave., Pittsburgh 13, Pa. ..... **APRIL 22-29, 1950.**

PROCESS INDUSTRIES CONFERENCE—Process Industries Division Conference of the American Society of Mechanical Engineers, at William Penn Hotel, Pittsburgh, Pa. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y. ..... **APRIL 24-26, 1950.**

OIL HEAT EXPOSITION — National Oil Heat Exposition, in conjunction with the 27th annual convention of Oil-Heat Institute of America, at Commercial Museum, Philadelphia, Pa. C. F. Curtin, secretary, 6 E. 39th St., New York 16, N. Y. ..... **APRIL 24-28, 1950.**

OHI OLD TIMERS' MEETING—Annual big time dinner and show meeting of the Old Timers' Club of the oil burner industry, at the Old Original Bookbinders restaurant, Philadelphia, Pa., during Oil-Heat Institute Convention. H. A. Maccubbin, secretary, 4616 Beacon St., Chicago 40, Ill. ..... **APRIL 25, 1950.**

AGA CONFERENCE—1950 Research and Utilization Conference of the American Gas Association, at the Hotel Statler, Cleveland, Ohio. Secretary of Association, 420 Lexington Ave., New York 17, N. Y. ..... **APRIL 25-26, 1950.**

SHEET METAL SHOW—Midwest Warm-Air Heating and Sheet Metal Exhibition, sponsored by the Sheet Metal Contractors Association of Illinois, Inc., at State Armory Building, Springfield, Ill. G. L. Folkers, exhibition chairman, 709 South Adams St., Peoria 2, Ill. ..... **APRIL 27-29, 1950.**

AIR POLLUTION CONFERENCE — United States Technical Conference on Air Pollution—the first Government sponsored conference of its kind—to be held in Washington, D. C. Dr. Louis C. McCabe, Chief of Air and Stream Pollution of the Bureau of Mines, Washington, D. C. ..... **MAY 3-5, 1950.**

ANTHRACITE CONFERENCE—8th annual Anthracite Conference at Packard Auditorium, Lehigh University, Bethlehem, Pa. Prof. A. C. Callen, conference chairman, Lehigh University. ..... **MAY 4, 1950.**

PETROLEUM GAS CONVENTION — Annual Convention and Trade Show of the Liquefied Petroleum Gas Association, Inc., at the Palmer House, Chicago, Ill. R. E. Borden, director of publicity, 11 So. LaSalle St., Chicago 3, Ill. ..... **MAY 8-11, 1950.**

CONTRACTORS MEETING — 1950 annual meeting of the Heating, Piping, and Air Conditioning Contractors National Association, at St. Francis Hotel, San Francisco, Calif. Secretary of Association, 1250 Avenue of the Americas, New York 20, N. Y. ..... **MAY 8-12, 1950.**

FLUID DYNAMICS CONFERENCE—Mid-western conference on fluid dynamics, together with a meeting of the American Physical Society at the University of Illinois, Urbana, Ill., in conjunction with the University's dedication of their new mechanical engineering building. Prof. S. Konzo, College of Engineering, University of Illinois..... **MAY 12-13, 1950.**

MASTER PLUMBERS CONVENTION — 68th annual convention, and 1950 home comfort exposition of the National Association of Master Plumbers, at Civic Auditorium, San Francisco, California. J. L. Sudler, 1105 K Street, N.W., Washington 5, D. C. ..... **MAY 17-20, 1950.**

SMOKE PREVENTION CONFERENCE—Annual conference of the Smoke Prevention Association of America, at the Mt. Royal Hotel, Montreal, Canada. D. A. Sullivan, public relations director of Association, 72 W. Adams St., Chicago 90, Ill. ..... **MAY 21-25, 1950.**

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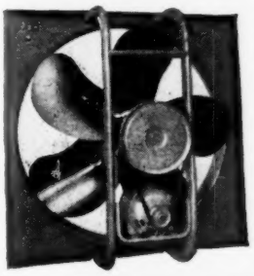

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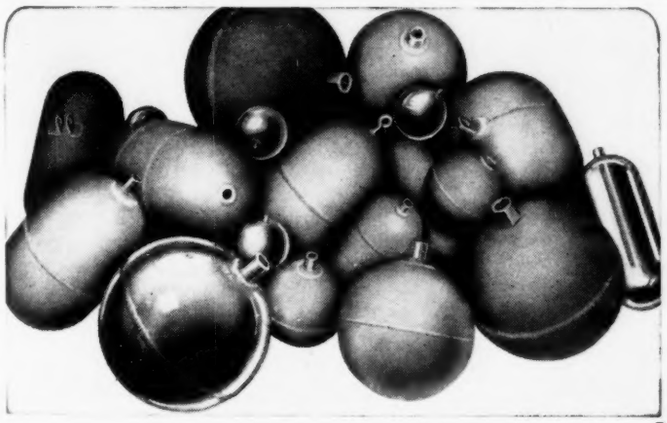

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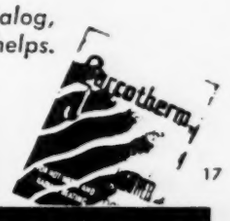

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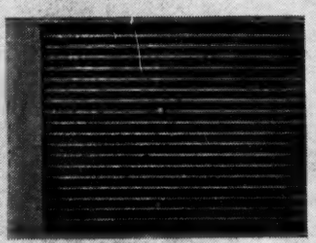

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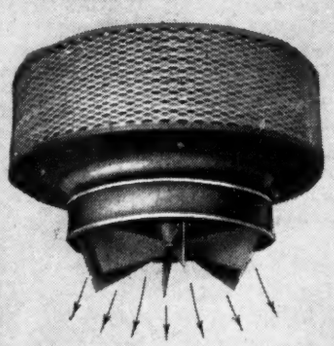

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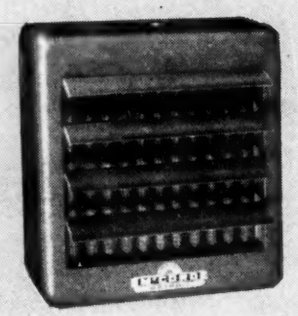

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NDHA MEETING — 41st annual meeting, National District Heating Association, at Grove Park Inn, Asheville, N. C. John F. Collins, Jr., secretary of Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. ..... **MAY 23-26, 1950.**

REFRIGERATION EXHIBIT—1950 Midwest Refrigeration and Air Conditioning Educational Exhibit and Conference, sponsored by Refrigeration Equipment Manufacturers Association and the Refrigeration Service Engineers Society, at the New Hotel Jefferson, St. Louis, Mo. Public Relations Department, REMA, 1346 Connecticut Ave., N.W., Washington 6, D. C. ..... **MAY 25-28, 1950.**

ASRE MEETING—Spring convention of the American Society of Refrigerating Engineers, at Hotel Muehleback, Kansas City, Mo. M. C. Turpin, secretary, 40 W. 40th St., New York 18, N. Y. ..... **JUNE 4-7, 1950.**

AUTOMOTIVE ENGINEERS MEETING — Summer meeting, Society of Automotive Engineers, at French Lick Springs Hotel, French Lick, Ind. John A. C. Warner, secretary of Society, 29 W. 39th St., New York 18, N. Y. ..... **JUNE 4-9, 1950.**

INDUSTRIAL RESEARCH CONFERENCE—Five-day conference on industrial research, conducted by the Department of Industrial Engineering, Columbia University, New York, at the University. Prof. David Bendel Hertz, 409 Engineering, Columbia University, New York 27, N. Y. ... **JUNE 12-16, 1950.**

STOKER MEETING—Annual meeting of the Stoker Manufacturers Association, at the LaSalle Hotel, Chicago. Marc G. Bluth, executive secretary of the Association, 307 No. Michigan Ave., Chicago 1, Ill. ..... **JUNE 13, 1950.**

ASHVE MEETING—1950 semi-annual meeting of the American Society of Heating and Ventilating Engineers, at the Royal Muskoka Hotel, on the Muskoka Lakes, Ontario, Canada. A. V. Hutchinson, secretary of Society, 51 Madison Ave., New York 10, N. Y. ..... **JUNE 18-21, 1950.**

ASME MEETING—Semi-annual meeting of the American Society of Mechanical Engineers, at Hotel Statler, St. Louis, Mo. C. E. Davies, secretary, 29 W. 39th St., New York 18, N. Y. ..... **JUNE 19-23, 1950.**

TESTING MATERIALS MEETING—53rd annual meeting and 9th exhibit of testing apparatus and related equipment, and 7th photographic exhibit, of the American Society for Testing Materials, to be held at Chalfonte-Haddon Hall, Atlantic City, N. J. Robert J. Painter, assistant secretary of the Society, 1916 Race St., Philadelphia 3, Pa. ..... **JUNE 26-30, 1950.**

INSTRUMENT CONFERENCE—5th national instrument conference and exhibit, of The Instrument Society of America, at Memorial Auditorium, Buffalo, N. Y. Richard Rimbach, executive secretary of the Society, 921 Ridge Ave., Pittsburgh 12, Pa. ..... **SEPTEMBER 18-22, 1950.**

INTERNATIONAL ENGINEERING CONGRESS — Third International Mechanical Engineering Congress, sponsored by The British Engineers' Association, to be held in Brussels, Belgium. A. W. Berry, Director of Association, 32 Victoria St., London, S.W. 1, England. ..... **SEPTEMBER 18-23, 1950.**

PETROLEUM CONFERENCE—Petroleum Mechanical Engineering Conference, at Hotel Roosevelt, New Orleans, La. Secretary, American Petroleum Institute, 50 W. 50th St., New York, N. Y. ..... **SEPTEMBER 25-27, 1950.**

AGA CONVENTION AND EXPOSITION—Biennial Exposition of Gas Appliances and Equipment, in conjunction with 1950 annual convention of the American Gas Association, at Convention Hall, Atlantic City, N. J. Secretary, AGA, 420 Lexington Avenue, New York 17, N. Y., and secretary, Gas Appliance Manufacturers Association, 60 E. 42nd St., New York 17, N. Y. ..... **OCTOBER 2-6, 1950.**

ASRE MEETING—Annual convention of the American Society of Refrigerating Engineers, at Hotel Commodore, New York. M. C. Turpin, secretary, 40 W. 40th St., New York 18, N. Y. ..... **DECEMBER 3-6, 1950.**

REFRIGERATION SHOW—7th All-Industry Refrigeration and Air Conditioning Exposition, at Navy Pier, Chicago, Ill. Show director, REMA, 1107 Clark Bldg., Pittsburgh 22, Pa. ..... **NOVEMBER 5-9, 1951.**

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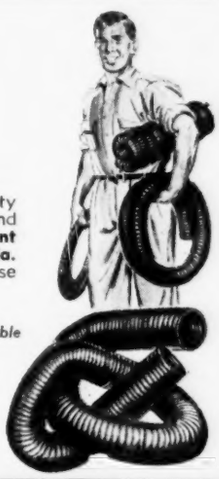

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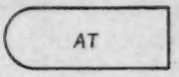
AUTOPSY TABLE 	DENTAL UNIT
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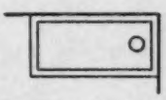
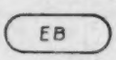
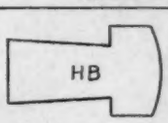
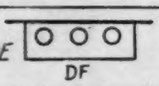
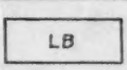
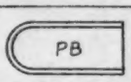
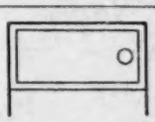
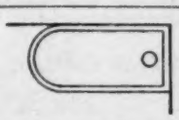
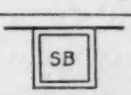
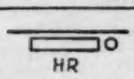
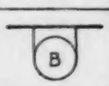
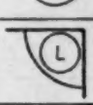
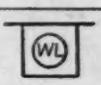
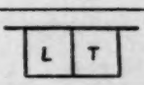
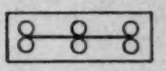
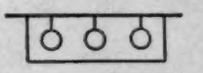
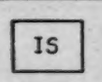
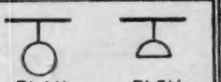
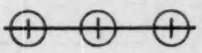
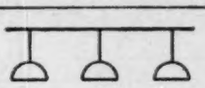
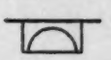
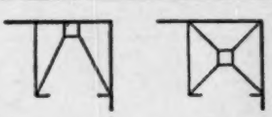
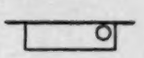
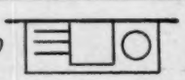
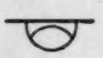
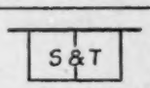
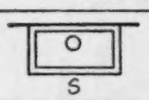
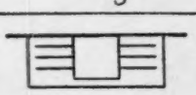
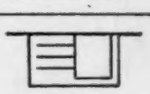
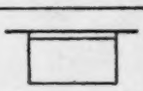
BATH, CORNER 	DRAIN, GARAGE
BATH. EMERGENCY 	DRAIN, FLOOR (With backwater valve)
BATH, FOOT	DRINKING FOUNTAIN
BATH, HUBBARD 	DRINKING FOUNTAIN, PEDESTAL TYPE
BATH, INFANTS	DRINKING FOUNTAIN, TROUGH TYPE 
BATH. LEG 	GAS OUTLET
BATH, PRENATAL 	GAS RANGE
BATH, RECESSED 	GREASE SEPARATOR
BATH, ROLL RIM 	HOSE BIBB
BATH, SITZ 	HOSE RACK 
BED PAN WASHER	HOT WATER TANK
BIDET 	LAVATORY, CORNER 
CAN WASHER	LAVATORY, DENTAL
CLEANOUT	LAVATORY, MANICURE (Or medical)
	LAVATORY, PEDESTAL
	LAVATORY, WALL 
	LAUNDRY TRAY 

AMERICAN STANDARD GRAPHICAL SYMBOLS – PLUMBING

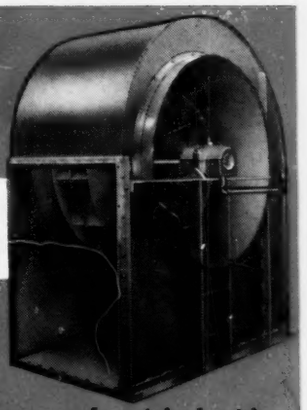
METER	SINK, WASH, FREE STANDING 
OIL SEPARATOR	SINK, WASH, WALL TYPE 
ROOF SUMP	STERILIZER, INSTRUMENT 
SHOWER, HEAD 	STERILIZER, PRESSURE
SHOWER, MULTI-STALL	STERILIZER, UTENSIL
	URINAL, CORNER TYPE
SHOWER, OVERHEAD GANG (Plan) 	URINAL, PEDESTAL TYPE
SHOWER, OVERHEAD GANG (Elevation) 	URINAL, STALL TYPE 
SHOWER, STALL 	URINAL, TROUGH TYPE 
SINK, COMBINATION DISHWASHER AND 	URINAL, WALL TYPE 
SINK, COMBINATION LAUNDRY TRAY AND 	VACUUM OUTLET
SINK, INSTRUMENT	WATER CLOSET, HIGH TANK
SINK, KITCHEN 	WATER CLOSET, LOW TANK
SINK, KITCHEN, WITH DRAINBOARDS 	WATER CLOSET, NO TANK
SINK, KITCHEN, WITH DRAINBOARD (Right-hand) 	WASH FOUNTAIN, CIRCULAR
SINK, SERVICE	
SINK, SERVICE, FLOOR-TYPE 	WATER FOUNTAIN, HALF-CIRCULAR
SINK, SURGEON'S SCRUB-UP	WATER HEATER

HEATING AND VENTILATING'S REFERENCE DATA

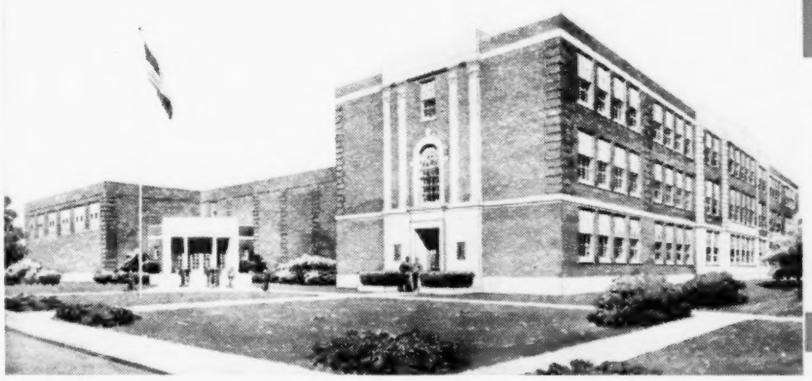
April, 1950

Gregory Hall, University of Illinois. Architect: Ernest L. Stouffer, University of Illinois. Engineer: Samuel R. Lewis, Chicago. Clarage fans installed for ventilation.

HIGH SPEED

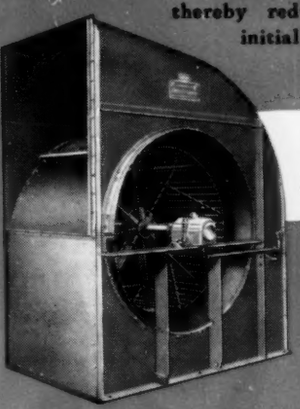


These fans are furnished with wheels of the non-overloading design, making possible the use of smaller motors for drive and thereby reducing initial cost.



Irondequoit High School, Irondequoit, N.Y. Architect: Carl C. Ade, Rochester, N.Y. Clarage fans installed for ventilation.

LOW SPEED



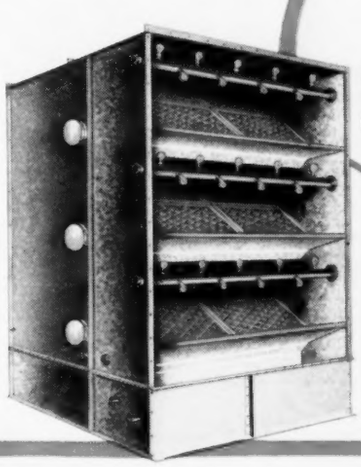
These fans have multiblade wheels with blades tipped forward in the direction of rotation. Extreme quietness of operation is the result.

HEAVY-DUTY Equipment

that's Well Known to Your Engineer and Contractor

Specialists in our field can conscientiously recommend Clarage equipment. They KNOW that we build for long-time, trouble-free operation — *that on the job Clarage equipment gives* BEYOND *average service.*

When your engineer specifies, and your contractor installs "Clarage" in your building, you can rest assured you are getting the best that the market now affords.



SPRAY AND CAPILLARY TYPES

Clarage air washers are suitable for any type of air conditioning, air cleaning, humidifying or dehumidifying service. Operation and maintenance costs are exceptionally low, installations can be made in minimum time, and all parts are readily accessible.

CLARAGE FAN COMPANY

KALAMAZOO, MICHIGAN

CLARAGE

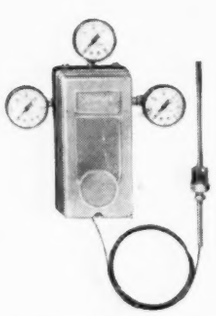
—HEADQUARTERS for Air Handling and Conditioning Equipment

APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

BIG—LITTLE—COMPLEX OR SIMPLE PROBLEMS

SOLVED BY JOHNSON

Blackberry Lane School, University City, Mo. William B. Ittner, Inc., architects and engineers; C. J. Moritz Heating Co., heating contractors, both of St. Louis.

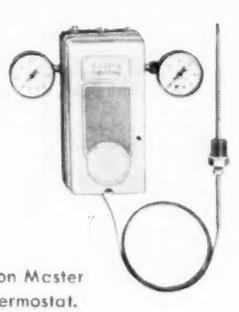


T-901 Johnson Sub-master hot water Thermostat.

Year after year, Johnson engineers have been employed to solve temperature control problems—to help put the breath of comfortable living into modern construction. Johnson plans, then manufactures and installs the complete control system. Regardless of the problem, each Johnson installation fits the specific need.

When you're in University City, Mo., step into the new Blackberry Lane School. Here, there are several problems, presented by a unique collection of heating and ventilating apparatus, which illustrate the extreme flexibility of Johnson Control. All of the heating units throughout the building are controlled by Johnson room thermostats. In the classrooms and auditorium, the thermostats provide Johnson *Proper Sequence* Control of the Johnson damper operators and valves on heating elements in the unit ventilators, together with the Johnson valves on auxiliary convectors. This correlation of the heating and ventilating equipment is extremely important in securing proper, unfluctuating temperature, without objectionable cold drafts.

Johnson *weather-compensated* anticipatory control, accomplished by the Sub-master and Master Thermostats pictured at the left, is applied to the radiant heating coils which supplement the unit ventilators and convectors in the classrooms. Changes in outdoor temperature are measured quickly, so that suitable compensations in panel temperatures may be made. The irritating "thermal lag", experienced with ordinary control, is avoided entirely.



T-900 Johnson Master Outdoor Thermostat.

Perhaps you have a question concerning temperature control. Talk it over with a nearby Johnson engineer. A consultation carries no obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in all Principal Cities.

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

DESIGN · MANUFACTURE · INSTALLATION · SINCE 1885

MAY, 1950

TECHNOLOGY DEPT.

HEATING AND VENTILATING

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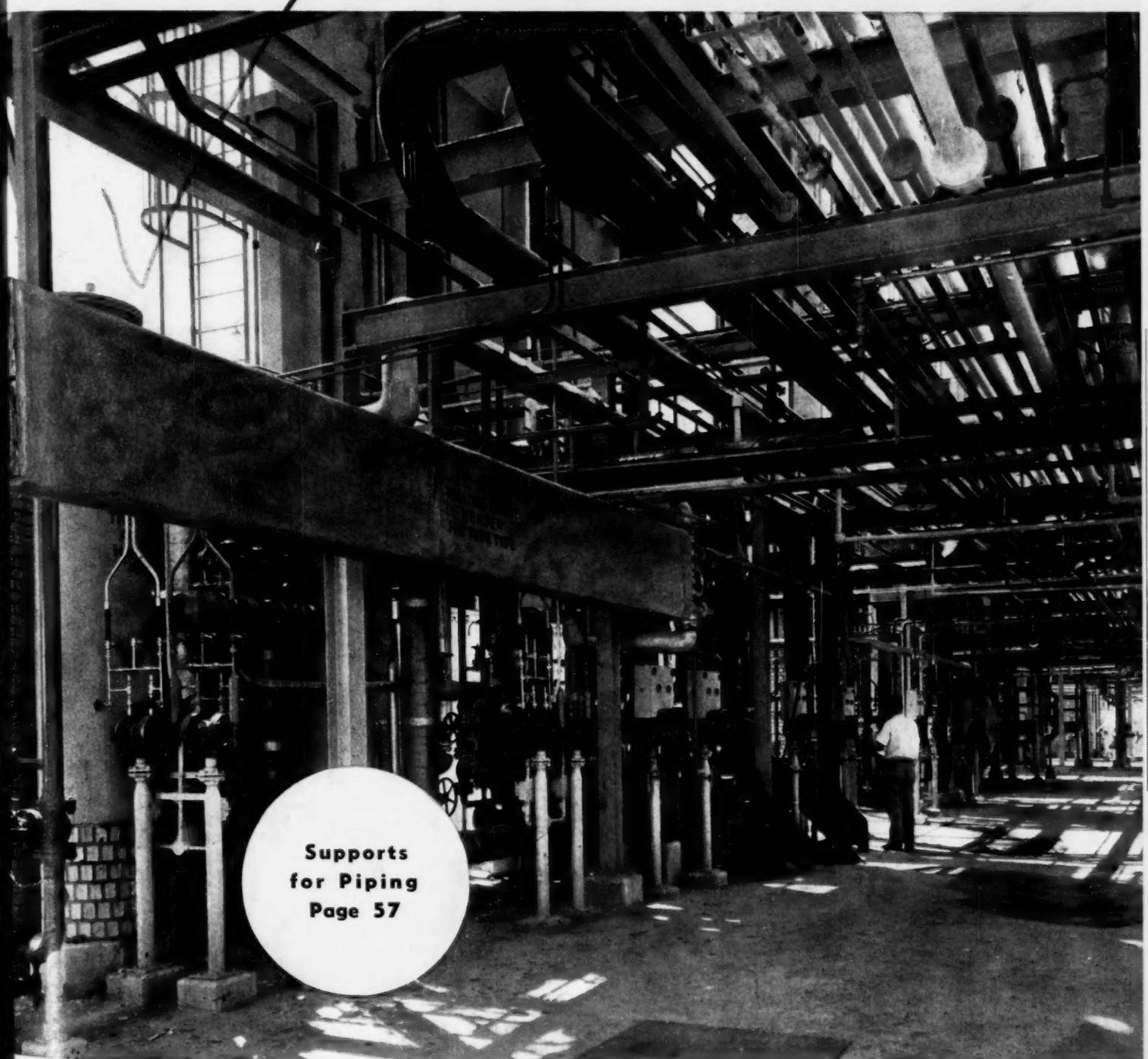
DETROIT

INCLUDING AIR CONDITIONING – PIPING – REFRIGERATION – AIR SANITATION



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ntilation Control for the rojection Room . page 51

Fitting Allowances in Pipe Measurement . . page 61

Exhaust Systems for Garages . page 65

Piping Design for Standpipes . page 69

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RIC-WIL 40th YEAR DEPENDABLE INSULATED PIPING SYSTEMS 1910 • 1950

Now

More than ever before you'll want

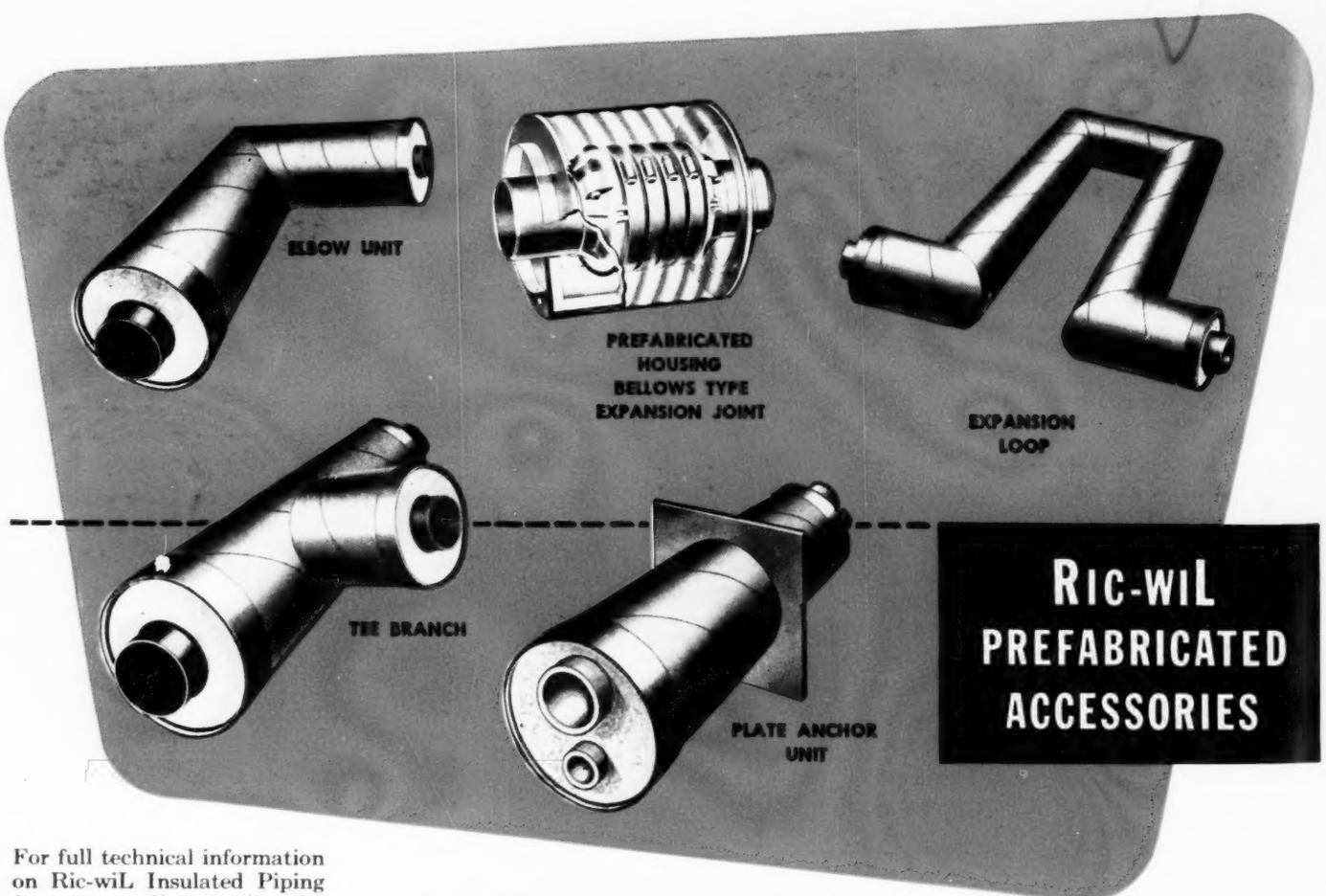
RIC-WIL *Prefabricated* Insulated Piping

Ric-wiL, for forty years the greatest name in insulated piping systems, has kept pace with every known development to produce the world's finest protection and insulation for underground or outside overhead piping systems. Alert and cost-conscious contractors and engineers realize the advantages of Ric-wiL prefabricated 21-foot "straight-run" sections.

Prefabricated accessory units save valuable installation labor costs by eliminating time-consuming makeshift field application of insulation.

The use of the finest known materials, and exacting manufacturing standards give Ric-wiL Insulated Piping Systems "built-in" features for high efficiency performance and extremely long maintenance-free life.

Call the Ric-wiL office nearest you and our representative will be glad to discuss your specific problems at your convenience.



RIC-WIL PREFABRICATED ACCESSORIES

For full technical information on Ric-wiL Insulated Piping Systems, call or write the Ric-wiL office nearest you or Dept. 2-R in Cleveland, Ohio.

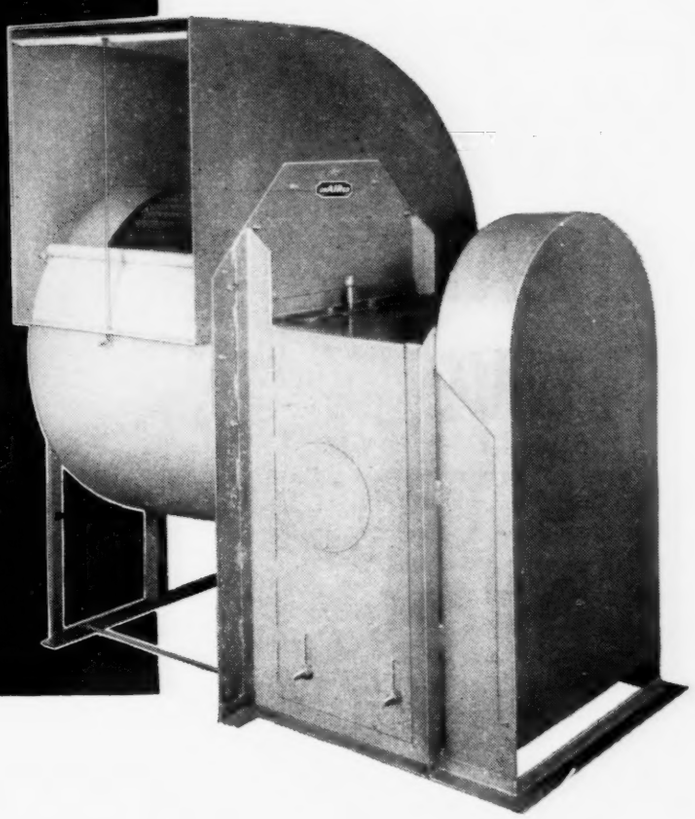
RIC-WIL
INSULATED PIPING SYSTEMS
THE RIC-WIL COMPANY • CLEVELAND, O.

OVERHEAD — UNDERGROUND

FOR FORTY YEARS THE GREATEST NAME IN INSULATED PIPING SYSTEMS

Announcing

usAIRco's NEW ALL WEATHER HOUSED VENTILATING SET



HERE'S a completely weather-proofed ventilating blower set that operates as efficiently and as safely outdoors as it does inside. usAIRco's Type CH Blower sets are compact, streamlined . . . need no complicated additions to adapt them for outdoor installation and are available in capacities from 800 cfm to 18000 cfm. Check the features!

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New Vari-Flo Control usAIRco's simple new air volume control makes it possible to regulate discharge over a wide range of pressures and volumes. Vari-Flo is designed so that changes in volume do not materially impair blower efficiency.

Long Life Bearings Heavy duty sleeve bearings are spherically seated and self-aligning. They run quietly with occasional lubrication. Weather cover needn't be removed for oiling.

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Adjustable Motor Mounting Special construction of adjustable motor mount permits easy belt tightening and reduces vibration to a minimum.

Efficient Motor Cooling Specially designed bearing jack provides for adequate motor and bearing ventilation. Tests prove the motor will not overheat under normal unit operating conditions.

Easy Duct Connection An inlet ring is provided to facilitate duct connections.

Fewer Parts Expert engineering has achieved a design involving fewer parts which means lower costs, lighter weight and less maintenance.

For more information on this new development in ventilation, write to United States Air Conditioning Corporation, 3341 Como Avenue S.E., Minneapolis 14, Minnesota.

usAIRco

Engineers and manufacturers of air conditioning, refrigeration, unit heaters, coils and ventilating equipment.